NASA CONTRACTOR REPORT

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THE EFFECT OF BEDREST ON VARIOUS PARAMETERS OF PHYSIOLOGICAL FUNCTION

PART IV. A SYSTEM FOR PROCESSING DATA COLLECTED IN THE IMMOBILIZATION STUDY UNIT

by C. Vallbona, W. A. Spencer, W. Blose, D. Cardus, F. B. Vogt, and J. Leonard

Prepared under Contract No. NAS 9-1461 *by*
TEXAS INSTITUTE FOR REHABILITATION AND RESEARCH
Houston, Texas
for

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION • WASHINGTON, D. C. • MARCH 1965

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ABSTRACT

The establishment of the Immobilization Study Unit for evaluating the effects of bedrest required a system for processing, storing, and retrieving the data collected during the studies. A system was developed that permitted entries to punch cards of data pertaining to the subject's identification, medical history, and physiological and sociological behavior during the study. Source documents of fixed format were used for collecting data at the bedside and in the laboratories. Analog to digital conversion was achieved by manually operated automatic digitizers. Several computer programs were written that permitted application of mathematical and statistical models to the analysis of the data collected.

FOREWORD

This study is a part of a NASA investigation of the effect of bedrest on various parameters of physiological function. It was sponsored by NASA Manned Spacecraft Center under Contract NAS-9-1461, with Dr. Lawrence F. Dietlein, Chief, Space Medicine Branch, serving as Technical Monitor.

This study was conducted in the Immobilization Study Unit of the Texas Institute for Rehabilitation and Research, The Texas Medical Center. The following authors are affiliated with Baylor University College of Medicine: Dr. Vallbona (Departments of Rehabilitation, Physiology, and Pediatrics), Dr. Spencer (Department of Rehabilitation), Dr. Cardus (Departments of Rehabilitation and Physiology), and Dr. Vogt (Department of Rehabilitation). Mr. Leonard is affiliated with the Data Systems Development Branch, NASA Manned Spacecraft Center, Houston, Texas.

The authors wish to express their appreciation for the participation of the Staff of the Biomathematics Research Laboratory of Baylor University College of Medicine and of the Data Systems Development Branch of the NASA Manned Spacecraft Center. Special acknowledgement is made to Mr. Rex Talbert and Mr. John Cowan of the Instrumentation and Electronics Systems Division of the NASA Manned Spacecraft Center who provided support for the program for analog to digital conversion of data; also, to Miss S. Beggs and Mrs. D. Bellis in the preparation of the manuscript and research assistance.

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SUMMARY

The establishment of the Immobilization Study Unit for the purpose of evaluating the physiological effects of bedrest required the provision of a system for processing, storing, and retrieving the data collected in the course of the studies.

A system was developed that permitted entries to punch cards of data pertaining to the subject's identification, past medical history, and physiological and sociological behavior during the study. Source documents of fixed format were used for collecting data at the bedside and in the laboratories. Analog to digital conversion was achieved by means of manually operated automatic digitizers. Several computer programs were written that permitted application of mathematical and statistical models to the analysis of the data collected.

INTRODUCTION

In May 1963, the staff of the Texas Institute for Rehabilitation and Research and the staff of the Crew Systems Division of the Manned Spacecraft Center of Houston, Texas, organized an Immobilization Study Unit to investigate the effects of prolonged bedrest in healthy subjects and to evaluate the effect of isometric exercise in preventing the potential deleterious effects of immobilization. The organization of this unit was preceded by a feasibility study conducted in March of 1963.

During the year of 1963, two separate studies were conducted. The first study consisted of two periods: the first period aimed at evaluating the cardiovascular and metabolic effects of three days of bedrest in six healthy subjects; the

second period had the purpose of establishing whether or not a program of isometric exercises carried out during the three days of bedrest could offset some of the metabolic and cardiovascular responses observed in the first period. The second study also consisted of two periods: the first period intended to establish the extent of the metabolic and cardiovascular deconditioning of 14 days of bedrest on another group of 6 healthy subjects. Five of these subjects and a seventh individual who had not participated in the first study took part in a second period of 14 days of bedrest with isometric exercises.

The experimental design for each period of these two studies was complex and called for the serial measurement of numerous physiological and biochemical variables. In addition, there was abundant collection of descriptive data pertaining to each one of the subjects, their subjective reaction to the study, and a description of the circumstances surrounding each one of the tests. In order to process these data adequately and to obtain the maximum amount of useful information, it was necessary to set up a system for data processing which is described in this report.

The implementation of this system for data processing was simplified by utilizing some aspects of the general system for processing medical record information of the Texas Institute for Rehabilitation and Research. This system has been in operation for the last five years, and much experience has been gained on the use of source documents for collecting data at the bedside and at the laboratory.[1,2,3,4] Experience previously acquired with different methods of coding data suggested the advisability of discarding coding techniques whenever possible and utilizing direct entries of numerical or alphabetic information.

THE MASTER FILE SYSTEM

An analysis of the different types of data to be collected in each one of the 13 subjects who participated in the two studies of the effects of bedrest indicated the need to set up a master file which would include the items described below. It is necessary to point out that at the termination of these two studies, not all the components of this file are in automatically retrievable form. It is intended, however, to complete the organization of the file in order to achieve full automation of the retrieval of data already collected and of data originating from future studies.

A. Subject's data

1. Identification data: These include the full name, birth date, sex, race, and date of admission to the Immobilization Study Unit. In the two immobilization studies described in this report, a standard Texas Institute for Rehabilitation and Research (TIRR) source document permitted entering this data on IBM punch cards. The format of this document is shown in the Appendix as Document #1. A second source document contained additional information such as address,telephone number, employer, etc. This information is variable and is considered irrelevant to the Master File. Document #2 of the Appendix shows the standard TIRR source document used for this purpose.

2. Past medical history: Items of interest in this category include prenatal history, neonatal history, growth and developmental data, immunization record, previous illnesses, record of past operations, and record of previous trauma. In order to enter these data on the healthy subjects who participated in the studies, a source document was designed for this purpose that could be filled out by each individual who was chosen as a candidate for a subject of the study. It is a simple task to transfer the data contained in this source document onto punch cards. Experience obtained by us and others in preparing source documents for entering past and current medical histories on punch cards was especially helpful in the preparation of this source document.[5,6,7,8] The source document does not allow for entries of data pertaining to women subjects since one of the conditions stipulated in the experimental design was that all subjects should be men. This medical history document is presented as Document # 3 of the Appendix.

3. Social and dietary habits: Data of this nature were also included in the special source document filled out by the candidates for the study (Document #3).

4. Family history: Pertinent data concerning the composition of the subject's family and the significant illnesses of hereditary and non-hereditary nature were also entered in the same source document (Document #3).

5. Psychological data: The data were obtained from an initial psychiatric interview with each individual who participated in the studies. The data reported included the subject's attitude toward the project, his psychological stability, and the psychiatrist's judgement of the capability of the subject to endure the experiment. No attempts were made to transfer this information onto punch cards.

6. Sociological data: This included descriptive data of a sociological nature according to a standard questionnaire utilized by the Social Service Departments of the Texas Institute for Rehabilitation and Research. This questionnaire is presented as Document #4 in the Appendix. In addition, there was a narrative report of the subject's sociological circumstances and an assessment of the Director of the Social Service Department regarding the subject's sociological behavior in the past and his motivation to participate in the experiments.

7. Circumstances of admission: In regular admission of patients to a hospital it is necessary to narrate as completely as possible the present illness that required hospitalization. The narration must be chronological and it must include time of onset, signs and symptoms, syndromes or diagnostic impairments, complications, medical and surgical treatments, diagnostic tests carried out, and the results of these tests. In the admission of healthy subjects for the purpose of the study of the effects of bedrest, there was no need to describe a present illness; but in order to fulfill the medical record requirements of the hospital, it was necessary to describe the reason for admission to the hospital and the highlights of the study to be conducted. This information was part of each subject's medical record.

8. Review of systems: It included information pertaining to the patient's usual manifestations of normal or abnormal function of the major systems of the body. Part of this information was included in the questionnaire filled out by each individual before his selection for the study.

9. Physical characteristics on admission: Height, weight, body surface area, and a full body picture with anterior-posterior and lateral view of the subject.

10. Physical examination: Data included pertained to the standard outline of a physical examination: general appearance, findings in the skin and lymph nodes, head, eyes, ears, nose, throat, neck, chest, heart, abdomen, genitalia, extremities, locomotor system, and neurological signs.

11. Clinical observations at the bedside: These included vital signs, intake and output, medications, physical data, signs and symptoms, and treatment procedures. In the first study, these data were entered in the standard source document utilized at the bedside for patients admitted to TIRR (Document #5). In the second study, two source documents were especially designed for the use in the Immobilization Study Unit (Document #6).

12. Physiological monitoring: Analog information pertaining to continuous or intermittent monitoring of the vital signs was part of the file also. The physiological variables that were recorded included the electrocardiogram, phonocardiogram, carotid and radial pressure pulse curves, arterial blood pressure by an electrosphygmographic method, and pneumogram. There were special physiological tests which required special analog recordings. The purpose of the recordings was to register the cardiovascular response to passive tilt before and after each period of bedrest, the response to a Valsalva maneuver, and the monitoring of the electrocardiogram, phonocardiogram, and carotid pulse tracings during isometric exercises. The analog records were collected on magnetic tape and adequately coded for future retrieval.

13. Laboratory data: All the results of laboratory tests carried out on the subjects throughout each period of the two studies were entered into standard laboratory source documents in use at the Texas Institute for Rehabilitation and Research. The entries of each source document were transferred onto punch cards. The data entered on these documents included results of hematology tests, urinalyses, blood chemistries, urine chemistries, and fecal analyses. The standard source documents of the laboratory of the Texas Institute for Rehabilitation and Research were used (Documents #7 through #11).

14. Dietary entries: Additional data pertaining to chemical analysis of diets and description of each menu offered to the subjects throughout the two periods of each study were indicated in a special source document designed by the research dietitian who supervised the

dietary aspects of the study (Document #12). The subject's acceptance of the menu, his appetite, and the amounts of food ingested were also recorded.

B. Environmental factors

The Immobilization Study Ward was located in the basement. The room had artificial lighting, and it was fully air conditioned with controlled temperature and humidity. There were no sensible fluctuations in room temperature and humidity throughout the study, although actual measurements were not made. A study of the effects of bedrest in a controlled environment should include information pertaining to room temperature, humidity, and barometric pressure. In addition, throughout the two studies it became evident that there were other factors which may influence the reaction of the individuals to the study. The intensity of lighting and noise seemed of importance. There was a constant degree of activity in the ward with considerable noise in the daytime. The lights were turned off at 9 p.m. and turned on at 7 a.m.

C. Census

In an active hospital ward, it is necessary to keep adequate census of the bed occupancy and of daily admissions and discharges. Although the census in the Immobilization Study Unit was constant throughout the periods of the study, it was necessary to give a daily report of the number of subjects who were in the ward or who were on leave of absence in the intervals between periods of study.

D. Task assignments

The complexity of the experimental design required daily assignment of the tasks to each one of the members of the team in charge of the Immobilization Study. This was especially helpful in assigning jobs to the ancillary personnel as well as in keeping adequate schedule of the activities planned for each subject everyday. These tasks were indicated in a master protocol outlined each day by the physician in charge of the Immobilization Study Unit and by his research assistant. Document #13 is a sample of the protocol for one day of the second study. The scheduling of activities was not an automatic process, but its complexity and the time required for its preparation warrant a study of the possibilities of adapting current data processing techniques such as PERT or RAMPS to facilitate this function.

E. General administration

The data processing system which is in operation at the Texas Institute for Rehabilitation and Research permitted auditing the costs of operation of the Immobilization Study Unit. Entries of services rendered and charges for these services were made in the standard documents of the Institute.

F. Personnel activities

The routine system utilized at the Texas Institute for Rehabilitation and Research allowed for entries of the regular work hours of every employee of the Immobilization Study, his overtime work, leave of absence, and vacations. This was combined with an equitable merit point system designed to reward the employees with above average performance and aptitudes.

PROCESSING OF ANALOG DATA

The serial physiological monitoring and the special physiological tests performed on the subjects who participated in the two studies required the organization of a system for recording, retrieving, and analyzing physiological analog data. The system is depicted in the diagram of figure 1.

The physiological events (bioelectrical in nature or transformed to an electrical signal) were displayed in analog form in an eight beam oscilloscope and in a direct writing instrument (a Physiograph or an Offner Dynograph). Simultaneously this information was recorded on analog tape. Special coding signals were entered in the tape at pre-established times. This facilitated the search of pertinent data at the time of playback. The playback was done at the recording paper speed most suitable for the type of analysis intended. Each record was edited for recognition of important points and of noise. The records were then ready for semi-automatic analog to digital conversion. This was accomplished by means of a Telecordex or a Benson Lehner OSCAR Model E. The digitized data were entered onto punch cards and displayed simultaneously in a typewriter which permitted immediate error checking. The data of punch cards were further tabulated for data editing and correction and submitted to computer transformation and analysis. The data derived from computer analysis was presented in digital plot display and in tabular form for further editing, correction, and interpretation as well as for re-evaluation of mathematical and statistical models to be used. Also the data resulting from statistical analysis was displayed in a graphic or tabular form for final interpretation.

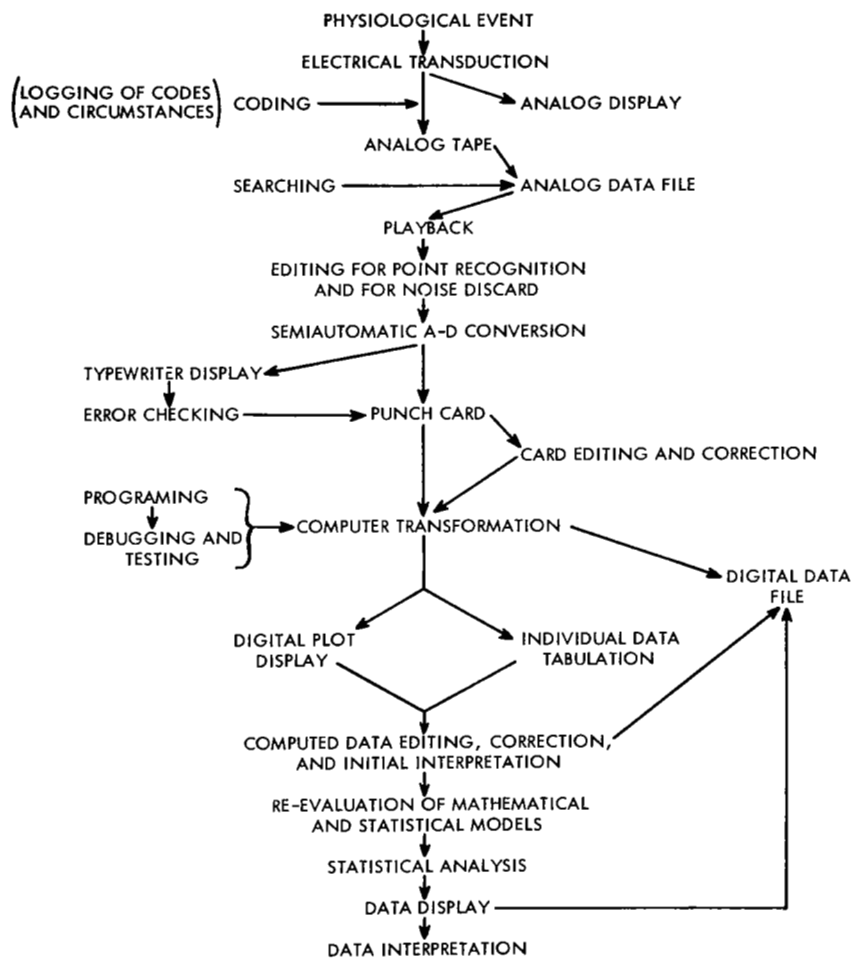

Figure 1. System for Analog Data Collection and Processing Developed in the Immobilization Study Unit of the Texas Institute for Rehabilitation and Research

It is clear that the system utilized in these two studies did not take full advantage of existing techniques and instruments for full automatization of the process. Under ideal circumstances the complete process could be achieved utilizing the system depicted in the diagram of figure 2. It must be understood, however, that the decision for not utilizing a system of this sort was not contingent upon difficulties for obtaining adequate instrumentation but rather on inherent limitation. A successful program for automatic analog to digital conversion must fulfill the following requirements:

1. Automatic search for points of interest.

2. Adequate noise discrimination.

3. Adequate file and storage capabilities.

4. Easy retrieval of the digitized information.

There are important problems arising from the need to fulfill each one of these requirements. The impossibility of finding a rapid solution of these problems precluded reliance on an automatic analog to digital conversion system for analyzing the data collected on the two studies within the expected time.

Problems inherent in the complete automatization of the computer processing must likewise fulfill the following requirements:

1. Adequate choice of analytic transformations.

2. Adequate choice of mathematical models for point recognition of the digitized information.

3. Adequate choice of mathematical models for a quantitative expression of the data.

4. Adequate choice of statistical models for tests of significance.

5. Efficient utilization of computer programing and debugging techniques.

Needless to say, there are major problems in the fulfillment of each one of these requirements. For this reason it was necessary to make provisions for adequate testing of the computer programs and for adequate digital and tabular display of the computed data to simplify their editing and correction before each major computation step.

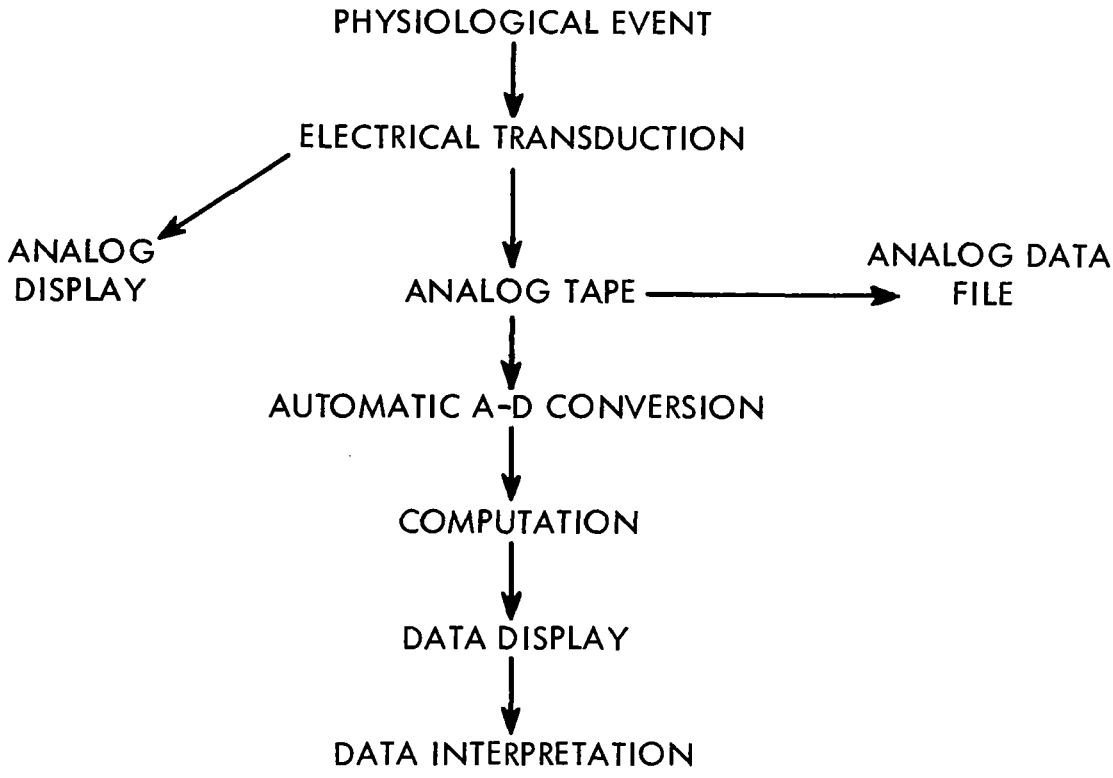

Figure 2. Ideal System for Collecting and Processing Analog Information

ANALOG RECORD EDITING

In order to process adequately each analog record obtained after playback of the magnetic tapes, it was necessary to proceed with the following steps:

1. Identification of the record according to the coding signal.

2. Labeling of the records in regard to the subject's name or number, date, time, and circumstances of test.

3. Discrimination of noise or other artifacts.

4. Selection of points to be recognized for semi-automatic analog to digital conversion. The recognition of these points was different depending on the type of records:

   a. The records obtained at slow paper speed (0.2 centimeters per second) were those pertaining to bedside physiological monitoring and to passive tilt. In each one of these records two points for digitization were selected every half of a minute in each one of the channels of recording: pneumogram, intra-arterial blood pressure, arterial blood pressure by the Korotkoff method,and cardiotachogram.

   b. Records obtained at fast paper speed (10 centimeters per second) were edited for recognition of the following points: the onset of the QRS complex of the electrocardiogram, the onset of the first and second sounds of the phonocardiogram, the onset of the ejection phase and the dicrotic notch of the carotid pulse tracing, and the onset of the ejection of the radial pulse tracing.

5. Establishment of the duration of records to be digitized:

   a. The slow speed records pertaining to bedside monitoring were digitized for the total time of recording which on the average was two to five minutes. The slow speed records during the passive tilt were digitized for the total time of the test which was usually 20 minutes.

   b. The fast speed records were digitized at each time of recording for a total length of 15 to 20 beats unless the RR interval of the electrocardiogram remained constant in which instance only 10 beats were edited for digitization.

SEMI-AUTOMATIC ANALOG TO DIGITAL CONVERSION

The conversion of the fast speed records from analog to digital form was made by means of a Telecordex. The slow speed records were digitized with a Benson Lehner OSCAR Model E. A Manual of Instructions was written for these tasks.

COMPUTER PROGRAMS

Several computer programs were written for the specific purpose of processing the data which were collected originally in alphanumeric form (numeric or alphabetic) or the data derived from the digitization of analog records.

A. Computer programs for measurements of cardiac dynamics

1. A computer program written by Mr. Floyd Rosenbaum of the Data Systems Development Branch of the Manned Spacecraft Center permitted processing of the digitized fast speed records of cardiac dynamics and permitted calculation of the total duration of the cardiac cycle beat-by-beat, the time of systole, the time of the isotonic phase of contraction, the time of the isometric phase of contraction, the pulse wave velocity, the predicted values of each one of these variables, and the ratios between observed and predicted values. This program yielded an output report as shown in figure 3. The program was executed with an IBM 7094 data processing system.

2. A separate program was written also by Mr. Floyd Rosenbaum to display a digital plotting of the variables computed with the first program. This allowed for adequate editing and subsequent modification of the program to discard automatically erroneous data which did not fulfill pre-established criteria for acceptance. An example of this plot is shown in figure 4.

3. An extension of the above computer programs permitted calculation of the average values of each variable at each period of recording with calculation of the averages and standard deviations for each variable. An example of the output is shown in figure 5.

4. A computer program written by Mr. Hadley Thompson of the Biomathematics Research Facility of Baylor University College of Medicine permitted calculation of the group averages and standard deviations for each time of testing and for each position of the individual (0°, 70°, etc.). An example of the output of this

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OBSERVATION 1

A	B	C	D	E	F
166.	278.	717.	1425.	1524.	3441.

T	S	I	X	M	V	R	S'	I'	M'
43.57	374.79	331.21	335.19	47.58	5.27	1021.00	394.07	305.60	88.47

OBSERVATION 2

A	B	C	D	E	F
200.	370.	706.	1449.	1558.	3448.

T	S	I	X	M	V	R	S'	I'	M'
53.16	385.17	315.79	332.50	69.38	6.89	1022.86	394.43	305.80	88.64

OBSERVATION 3

A	B	C	D	E	F
227.	438.	736.	1475.	1565.	3959.

T	S	I	X	M	V	R	S'	I'	M'
60.34	392.34	307.55	331.74	84.53	7.05	1052.37	400.08	308.81	91.27

OBSERVATION 4

A	B	C	D	E	F
197.	381.	709.	1424.	1532.	4095.

T	S	I	X	M	V	R	S'	I'	M'
52.57	374.52	305.95	326.16	72.57	7.05	1088.52	406.89	312.43	94.47

OBSERVATION 5

A	B	C	D	E	F
194.	384.	695.	1401.	1533.	4216.

T	S	I	X	M	V	R	S'	I'	M'
52.65	372.41	305.42	319.78	66.99	7.44	1120.64	412.86	315.58	97.28

Figure 3. Computer output of the values of cardiac dynamics in successive heart beats. A,B,C,D, and E are readings obtained from an analog to digital converter. T= interval between onset of QRS and onset of first heart sound, S= time of systole, I = time of isotonic phase, M = time of isometric phase, X = interval between onset of first and second heart sounds, V = pulse wave velocity, R = total duration of cardiac cycle, S' = predicted systole, I' = predicted isotonic phase, and M' = predicted isometric phase.

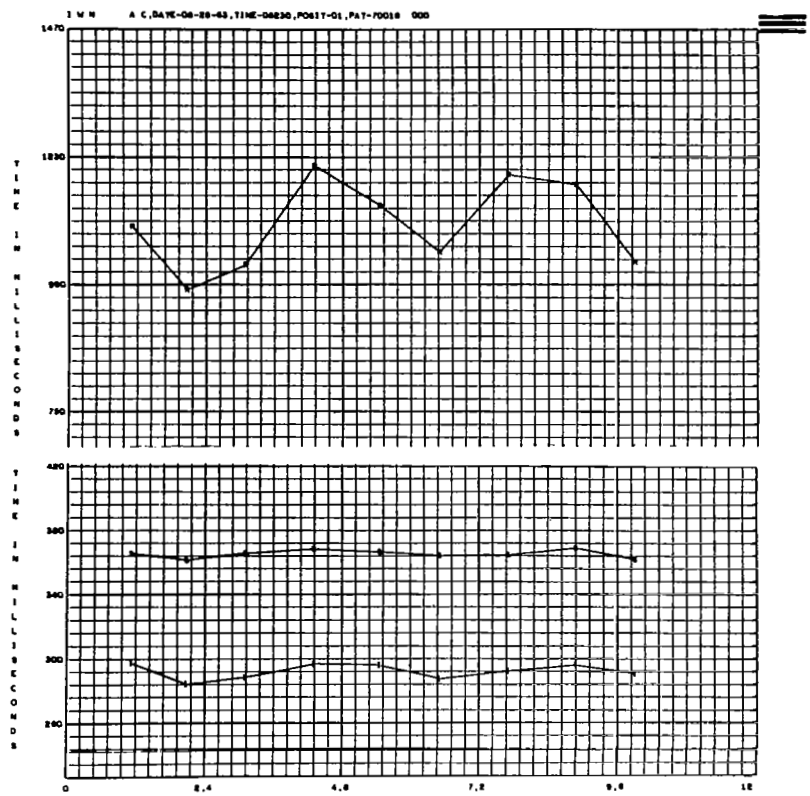

Figure 4. Graphic plots of total duration values of the cardiac cycle and its phases and successive heart beats.

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         *********THE DATE OF THIS REPORT FOR TILTS IS 7/6/64**********
96.  673.  453.  L    ( E, A. C.   70011/POSIT   3/TIME  10030/DATE  72263     CALIB.  3741( .26731)

AVERAGE  T   AVERAGE  S  AVERAGE  I   AVERAGE  X   AVERAGE  M   AVERAGE  V   AVERAGE  R   AVERAGE S'   AVERAGE I'  AVERAGE M'
   47.22       352.16      218.57       254.94        83.59        10.56       811.53       361.70       288.06       73.65

STD.DEV. T   STD.DEV. S  STD.DEV. I   STD.DEV. X   STD.DEV. M   STD.DEV. V   STD.DEV. R   STD.DEV.S'   STD.DEV.I'  STD.DEV.M'
    3.76         6.41        8.19         5.35         6.81         0.66       148.14         5.05         2.78        2.28

RATIO T/M'   RATIO S/S'  RATIO I/I'   RATIO X/I'   RATIO M/M'   RATIO T/M    RATIO X/I
 0.641175    0.9735377   0.759787     0.885028     1.134945     0.564940     1.166373

                 RANGE OF S                RANGE OF I                 RANGE OF V                RANGE OF R
                 MIN      MAX              MIN      MAX               MIN      MAX              MIN       MAX
  CALCULATED    255.84   347.48           185.79   251.36             5.34    14.78           486.92   1136.15
    ACTUAL      290.94   309.66           208.75   233.58             7.52    11.75           372.40    900.96
```

Figure 5. Computer output of average values and standard deviations of the cardiac dynamics in the steady state of the tilt position.

program is shown in figure 5. The programs were executed with an IBM 1620 computer and an IBM 1410 system.

5. A modification of library routine programs was used for statistical tests of significance of differences observed in the groups of individuals who were studied on various dates.

B. Computer programs for measurements of circulatory dynamics

1. A program written by Miss Martha Lewis of the Data Systems Development Branch of the Manned Spacecraft Center permitted processing of the digitized data of passive tilt tests and calculations of the systolic and diastolic arterial blood pressures, mean blood pressure, and pulse pressure both from intra-arterial pressure curves and from recordings obtained with an electrosphygmomanometer. An example of the output of this program is shown in figure 6. The program was executed with an IBM 7094 computer.

2. An extension of the above program permitted plotting in digital form the results obtained during passive tilt tests in each individual subject (figure 7).

3. Likewise, a program was written for calculation and plotting the group averages for each one of the variables indicated above (figure 8).

4. A program written by Mrs. Anne Christofferson and by Mr. Tom McBride of the Biomathematics Research Facility of Baylor University College of Medicine permitted calculation of the slopes of changes in heart rate and systolic and diastolic arterial blood pressures, mean blood pressure, and pulse pressure during passive tilt tests. The program was executed with an IBM 1620 computer (figure 9). Adaptation of available programs for statistical analysis permitted the calculation of averages and standard deviations of different parameters of the regression analysis carried out on each subject.

5. A program for final reporting of the regression analysis data in tabular form was written by Mr. Tom McBride of the Biomathematics Research Facility of Baylor University College of Medicine for the IBM 1410 system. An example of the output format is given in figure 10.

6. A special program was written by Mr. Hadley Thompson of the Biomathematics Research Facility of Baylor University College of Medicine for

SUBJECT NO 70007 DATE 50663 HOUR 4001 PAGE 1

TIME T1-T	CBP Y1	ABPS Y2	ABPD Y3	HR Y4	DY	YM	DY2	YM2
2.64	136.	0.	0.	87.	0.	0.	74.	87.
2.51	62.	0.	0.	87.	0.	0.		
1.73	128.	130.	77.	90.	53.	95.	64.	85.
1.62	64.	130.	74.	87.	56.	95.		
0.61	140.	140.	77.	86.	63.	98.	81.	86.
0.48	59.	134.	78.	78.	56.	97.		
T1+T								
0.41	0.	133.	77.	95.	56.	96.	0.	0.
0.53	0.	118.	69.	98.	49.	85.		
1.35	136.	119.	79.	106.	40.	92.	64.	93.
1.46	72.	125.	90.	104.	35.	102.		
2.37	0.	127.	78.	103.	49.	94.	0.	0.
2.48	71.	131.	79.	103.	52.	96.		
D1+T								
0.06	0.	128.	82.	101.	46.	97.	0.	0.
0.20	0.	143.	87.	91.	56.	106.		
1.08	138.	0.	0.	85.	0.	0.	75.	88.
1.21	63.	0.	0.	87.	0.	0.		
2.07	136.	132.	81.	89.	51.	98.	76.	85.
2.20	60.	133.	76.	81.	57.	95.		
3.07	145.	146.	86.	79.	60.	106.	70.	98.
3.19	75.	144.	87.	92.	57.	106.		
4.03	0.	134.	77.	91.	57.	96.	0.	0.
4.15	67.	135.	79.	80.	56.	98.		
5.05	138.	133.	78.	75.	55.	96.	79.	85.
5.19	59.	129.	78.	82.	51.	95.		
6.00	138.	124.	92.	75.	32.	103.	71.	91.
6.12	67.	0.	0.	74.	0.	0.		
7.02	145.	137.	81.	81.	56.	100.	83.	90.
7.16	62.	126.	75.	71.	51.	92.		
7.99	132.	119.	77.	81.	42.	91.	75.	82.
8.12	57.	124.	74.	75.	50.	91.		

Figure 6. Computer output of the average values of circulatory dynamics throughout the tilt tests. CBP indicates the reading of the blood pressure measured with an electrosphygmomanometer. ABPS = arterial blood pressure systolic, ABPD = arterial blood pressure diatolic, HR = heart rate, DY = pulse pressure, and YM = mean blood pressure.

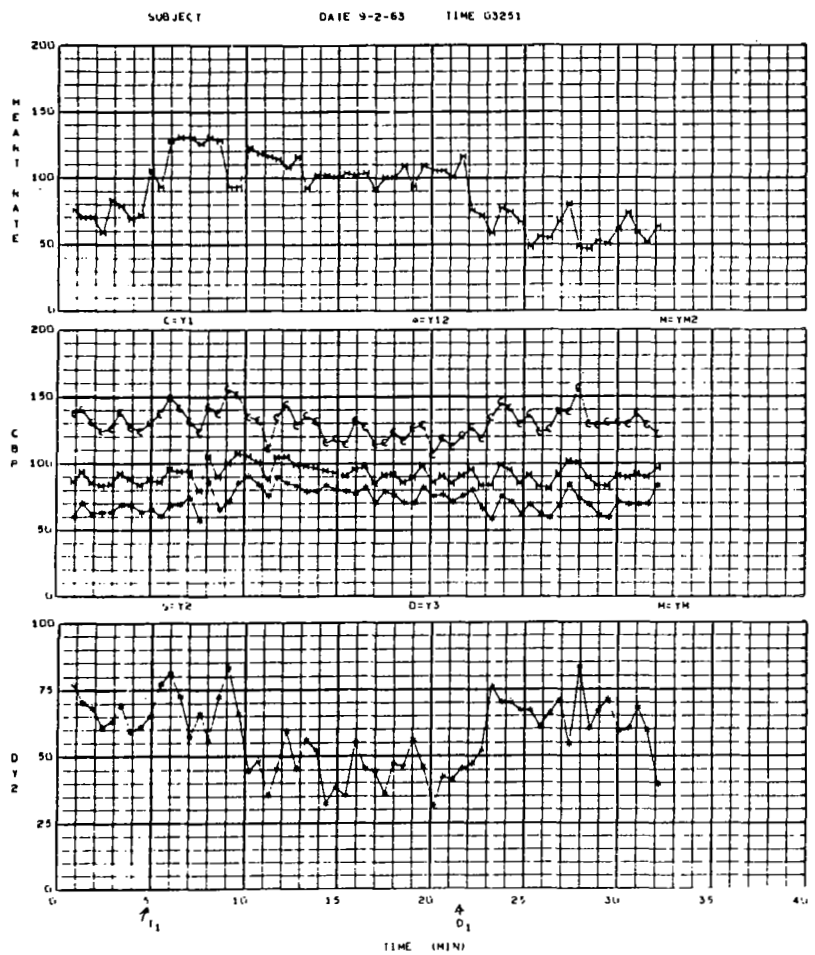

Figure 7. Plots of circulatory dynamic values during passive tilt tests on an individual subject.

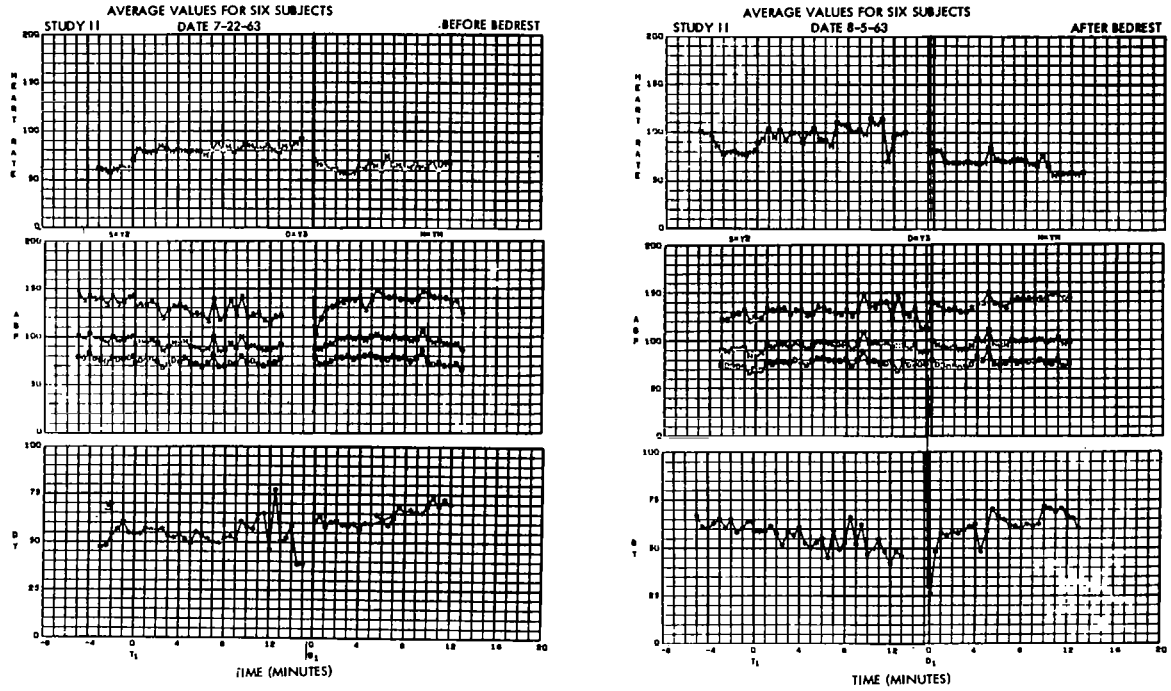

Figure 8. Graphic plots of circulatory dynamics for a group of six subjects throughout the tilt procedure.

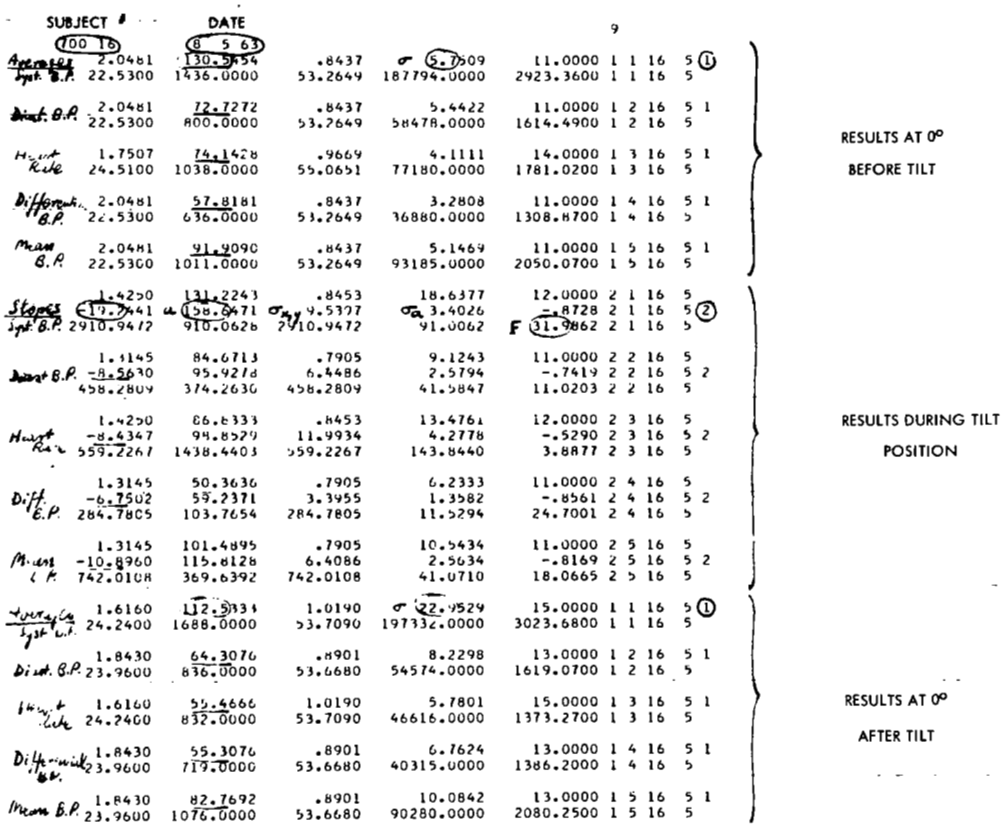

Figure 9. Computer output of the results of statistical analysis of circulatory dynamics during the passive tilt test.

SUBJECT # 70008 DATE 5/ 6/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	123.7	4.4	7
BP DIAST	66.7	3.0	7
H. R.	69.3	3.9	8
PULSE PRESS	57.0	2.2	7
MEAN PRESS	85.5	3.4	7

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	125.7	21.4	163.9	5.8	-21.38	3.4	4	37.9
BP DIAST	76.2	14.2	100.6	6.1	-13.63	3.6	4	14.1
H. R.	86.1	3.3	83.9	3.4	1.40	1.7	6	.6
PULSE PRESS	49.5	7.9	63.3	2.9	-7.75	1.7	4	20.0
MEAN PRESS	93.0	16.4	121.7	5.9	-16.07	3.5	4	20.6

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	121.7	4.2	4
BP DIAST	74.4	29.4	5
H. R.	58.7	2.4	7
PULSE PRESS	60.5	4.7	4
MEAN PRESS	81.2	1.5	4

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	137.3	18.6	203.1	12.9	-10.28	3.3	9	9.5
BP DIAST	84.7	11.4	123.3	8.4	-6.02	2.1	9	7.8
H. R.	97.1	5.8	86.9	5.7	1.58	1.4	9	1.1
PULSE PRESS	52.5	8.6	79.7	6.8	-4.25	1.7	9	5.8
MEAN PRESS	102.2	13.6	150.3	9.4	-7.52	2.4	9	9.5

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	122.5	7.0	4
BP DIAST	66.2	6.8	4
H. R.	61.8	4.3	7
PULSE PRESS	56.2	7.6	4
MEAN PRESS	84.7	5.8	4

Figure 10. Edited computer output of the results of statistical analysis of circulatory dynamics during the passive tilt test.

plotting the vital signs on each subject throughout the periods of bedrest (figure 11). These plots were made with an IBM 1627 Plotter* connected with the IBM 1620 computer.

C. Measurements of circulatory dynamics during a Valsalva maneuver

1. A program was written by Mr. Tom McBride and Mr. Mike Alexander of the Biomathematics Research Facility of Baylor University College of Medicine to calculate the slopes of systolic and diastolic arterial blood pressure, mean blood pressure, pulse pressure, heart rate, stroke volume, cardiac output, and total peripheral resistance during different phases of the Valsalva maneuver. The program was executed with an IBM 1620 computer.

2. A special program was also written to calculate the best polynomial fit for the curve of the mean blood pressure during the phase of forced expiration. The program calculated the minimum amplitude and the time when this minimum amplitude occurred in each subject. The results obtained in each group of subjects studied on the same day were averaged. Likewise a program was adapted for calculation of the time constant of the return of the mean blood pressure to normal following the phase of overshoot upon release of the intrathoracic pressure.

3. The statistical analysis of the significance of the differences observed was carried out using available program library routines.

D. Ergometry test data

The data pertaining to changes in heart rate during the performance of an ergometry test were computed according to a program especially written for the purpose of plotting duration of the cardiac cycle beat-by-beat before, during, and after exercise. The program calculated also the time constant of the drop in heart rate at the time of recovery. This program had been developed by one of the authors (D.C.) and previously reported.[9]

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*Manufactured by Calcomp under brand name IBM 1627.

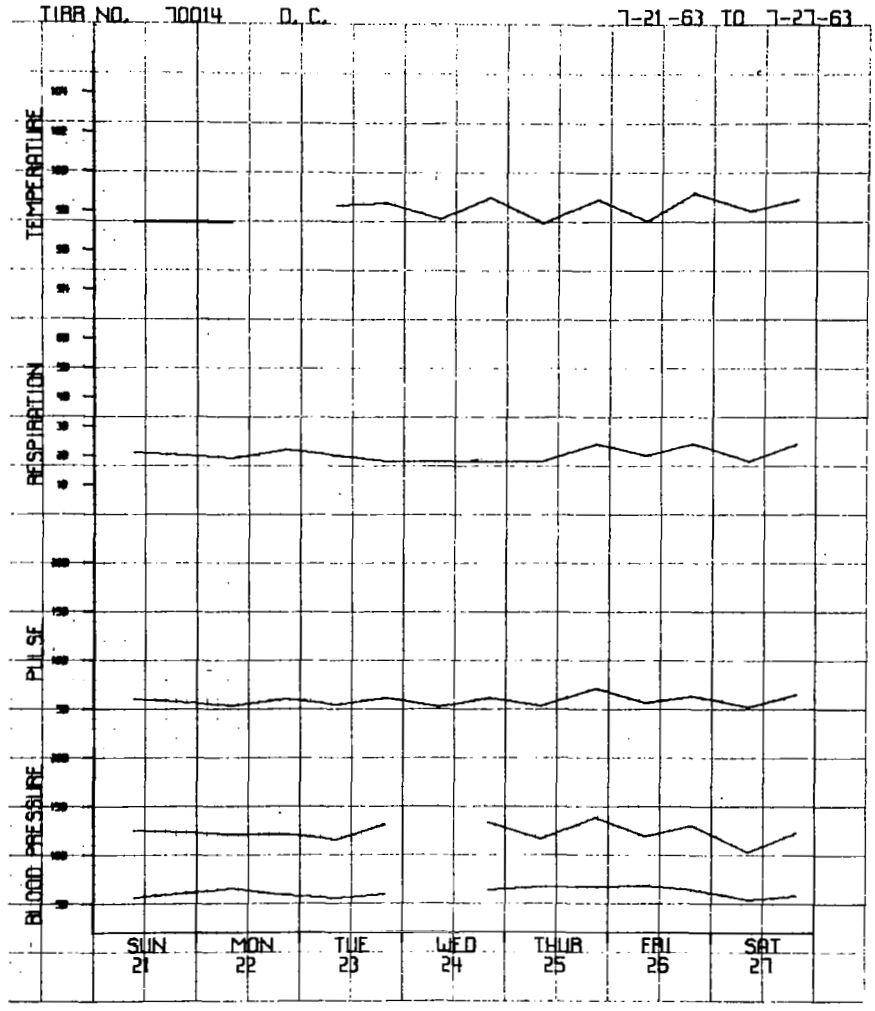


Figure 11. Plots of vital signs during a week of bedrest on an individual subject.

E. Laboratory data

1. The general programs used at the Texas Institute for Rehabilitation and Research for serial reporting of laboratory values were utilized in the two studies. Examples of the serial reports of laboratory data are presented in figures 12 and 13. Reports of this type were available for hematology, urinalysis, blood chemistry, and urine chemistry values.

2. A special program was developed by Mr. Tom Daniel of the Data Systems Development Branch of the Manned Spacecraft Center for computation of the statistical significance of the differences obtained in the laboratory values of blood corticoids in the first study.

CONCLUSION

The establishment of an Immobilization Study Unit for the purpose of evaluating the physiological effects of bedrest required the provision of a system for processing, storing, and retrieving the data collected in the course of the studies. A system was developed that permitted entries to punch cards of data pertaining to the subject's identification, past medical history, and physiological and sociological behavior during the study. Source documents of fixed format were used for collecting data at the bedside and in the laboratories. Analog to digital conversion was achieved by means of manually operated automatic digitizers. Several computer programs were written that permitted application of mathematical and statistical models to the analysis of the data collected.

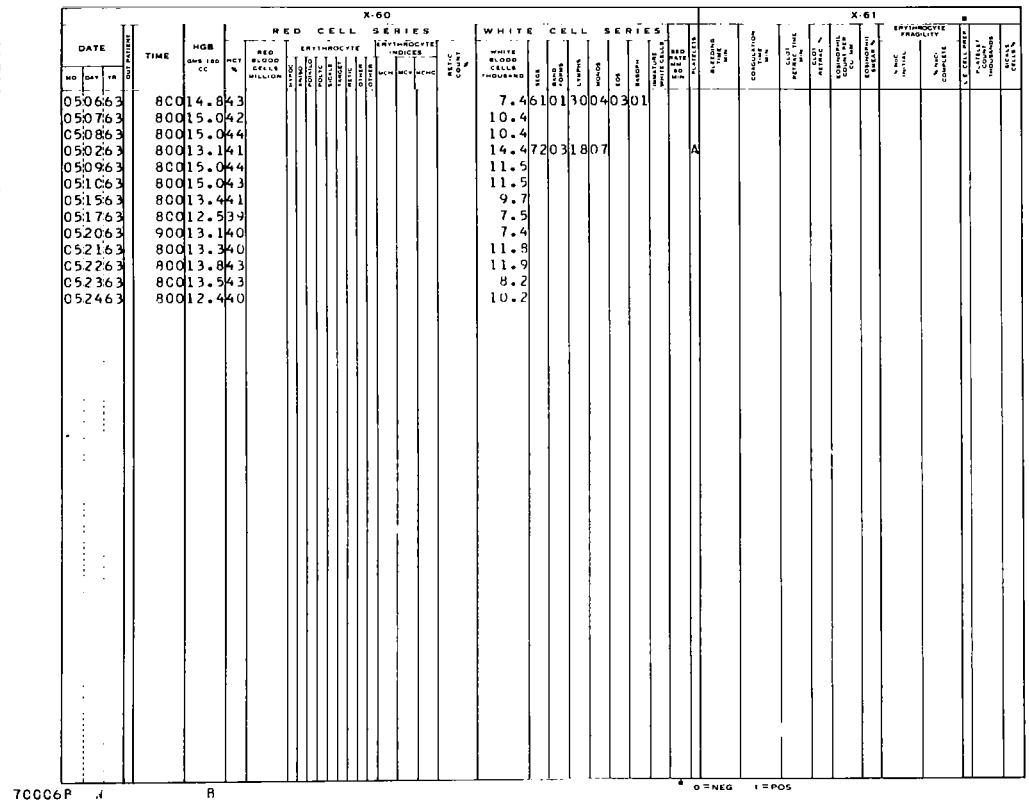


Figure 12. Computer generated report of the results of hematology tests on an individual subject.

URINE CHEMISTRY

DATE MO	DAY	YR		SPECIMEN NUMBER	TIME COLL. HR	MIN	VOLUME OF SPECIMEN ml	PROTEIN g	CHLORIDES meq	SODIUM meq	POTASSIUM meq	MAGNESIUM meq	CALCIUM meq	PHOSPHATE INORG mg	TOTAL CO2 meq	GLUCOSE g	CREATINE g	CREATININE g	CREATININE CLEARANCE ml per 24 h	PSP % Excretion 15 30 60
05	03	63	1200		2400		1400		204	1	35		7.0	24.9				1.80		
05	04	63	1200		2400		1720						8.6	30.6				2.08		
05	05	63	1200		2400		900						7.4	22.4				1.42		
05	06	63	1200		2400		1130						6.5	37.3				1.60		
05	07	63	1200		2400		1390		236	2	54		7.4	38.0				1.63		
05	08	63	1200		2400		1300						7.9	33.6				1.75		
05	09	63	1200		2400		1600		173	1	61		5.4	30.9				1.32		
05	10	63	1530		2400		880		129	1	61		5.4	26.9				1.57		
05	11	63	1200		2400		1300						6.0	31.4				1.56		
05	17	63	1200		2400		2280		324	3	47		7.8	36.8				1.47		
05	18	63	1200		2400		1560						6.1	27.7				1.64		
05	19	63	1200		2400		1650						6.7	33.2				1.50		
05	20	63	1200		2400		940						5.3	37.0				1.58		
05	21	63	1200		2400		2100		290	3	57		6.5	28.4				1.53		
05	22	63	1200		2400		1470						6.6	30.8				1.56		

CODE: VOIDED, CATHETER

7CC06B1 B

Figure 13. Computer generated report of the results of urine chemistry tests on an individual subject.

REFERENCES

1. Spencer, W. A. and Vallbona, C.: Digitation of Clinical and Research Data in Serial Evaluation of Disease Processes. IRE Trans. Med. Electronics ME-7: 296, 1960.

2. Spencer, W. A. and Vallbona, C.: A Preliminary Report on the Use of Electronic Data Processing Technics in the Description and Evaluation of Disability. Arch. Phys. Med. 43: 22, 1962.

3. Vallbona, C.: Processing Medical Information at the Bedside. 4th IBM Medical Symposium: p. 405, 1962.

4. Vallbona, C.: An Automated Approach to the Individual Health Record. Proceedings of the New England Conference on Community Health Records Management: p. 71, 1962.

5. Schenthal, J. E., Sweeney, J. W., and Nettleton, W. J., Jr.: Clinical Application of Large-Scale Electronic Data Processing Apparatus. J. A. M.A. 173: 6, 1960.

6. Schwichtenberg, A. H. Flickinger, D. D., and Lovelace, W. R.: Development and Use of Medical Machine Record Cards in Astrounaut Selection. U. S. Armed Forces Med. J. 10: 1324, 1959.

7. Aeromedical Evaluation for Space Pilots, USAF School of Aerospace Medicine, Aerospace Medical Division, (AFPS), SA Brooks Air Force Base, Texas, July, 1963.

8. Luykx, H. M.C.: Modernizing the Management of the Air Force Medical Service. J. A. M. A. 184: 102, 1963.

9. Cardus, D.: A Study of the Frequency of the Heart in the Early Phase of Recovery Following Muscular Exercise. 5th IBM Medical Symposium: 1963.

APPENDIX

Document #1 Basic identification information (TIRR document)

INPATIENT [ ]

OUTPATIENT [ ]

TEXAS INSTITUTE FOR REHABILITATION AND RESEARCH

IN THE

TEXAS MEDICAL CENTER

HOUSTON, TEXAS

PATIENT NUMBER (1-5)

PATIENT'S NAME (LAST, FIRST & MIDDLE) (6-30)	ADMISSION DATE		DATE OF BIRTH (31-41)
PATIENT'S ADDRESS (STREET & ZONE NUMBER)	DATE OF ONSET (42-52)	SEX (53) M F / RACE (54) / RELIGION (55)	
ACUTE TREATMENT (56) HOSPITAL CITY		DATE FIRST SEEN S. W. P. R. R. C. (57-62) T. I. R. R. (63-68)	
PRE-ILLNESS HEIGHT ____ (69-70) WEIGHT ____ (71-73)	POLIO VACCINE (74-75) TYPE ____ NO. OF INOCULATIONS	BLOOD TYPE - RH (76-77) (78)	CARD (79-80) 0 1

ADMISSION DATE	DISCHARGE DATE	ADMISSION DATE	DISCHARGE DATE
1.		18.	
2.		19.	
3.		20.	
4.		21.	
5.		22.	
6.		23.	
7.		24.	
8.		25.	
9.		26.	
10.		27.	
11.		28.	
12.		29.	
13.		30.	
14.		31.	
15.		32.	
16.		33.	
17.		34.	

#2

BASIC INFORMATION
MEDICAL RECORD DEPARTMENT

TO BE INSERTED UNDER COPY #1
ON FIRST ADMISSION ONLY

Document #2 Face sheet with additional information (TIRR document)

INPATIENT ☐

OUTPATIENT ☐

TEXAS INSTITUTE FOR REHABILITATION AND RESEARCH

IN THE

TEXAS MEDICAL CENTER

HOUSTON, TEXAS

PATIENT NUMBER (1-5)

PATIENT'S NAME (LAST, FIRST & MIDDLE) (6-20)	ADMISSION DATE (21-31)	TIME	DISCHARGE DATE (32-42)	TIME	DATE OF BIRTH

PATIENT'S ADDRESS (STREET & ZONE NUMBER)	DATE OF ONSET	SEX (43) M / F	RACE (44)	RELIGION	NO. OF ADMS. (45-46)

CITY	COUNTY (47-49)	STATE (50-51)	PHONES	MARITAL STATUS	AGE (52-54)
			DAY NIGHT	SINGLE / MAR. / SEP. / WID. / DIV.	YEARS / MONTHS

ATTENDING PHYSICIAN	ADMITTING DIAGNOSIS	PROGRAM AT ADMISSION	RESP. STATUS (71)	ISOLATION
				☐ YES ☐ NO

SOURCE OF REFERRAL (72)	NAME OF REFERRING PHYSICIAN	ADDRESS	PHONES
☐ 1. PRIV. PHY. ☐ 3. O.P.D. ☐ 2. HOSPITAL ☐ 4. OTHER			OFFICE HOME

SPONSOR ADDRESS

HEAD OF HOUSEHOLD EMPLOYED BY	OCCUPATION OF PATIENT	IS PATIENT VET.?	V. A. CLAIM NUMBER

SPOUSE OR NEAREST KIN	ADDRESS	PHONE: HOME / OFFICE	RELATIONSHIP

NOTIFY IN EMERGENCY	ADDRESS	PHONE: HOME / OFFICE	RELATIONSHIP

LOCAL TEMPORARY ADDRESS OF RELATIVE PHONE RELATIONSHIP

NAME OF INSURANCE COMPANY	NAME OF INSURANCE COMPANY
NAME OF INSURED & POLICY NUMBER	NAME OF INSURED & POLICY NUMBER

ALLERGIES

	ATTENDING PHYSICIAN (55-57)	PROGRAM (58-60)	DATE OF CHANGE	DAYS STAY C PHYSICIAN OR ON PROGRAM (61-63)
ON ADMISSION				
TRANSFER TO				
TRANSFER TO				
TRANSFER TO				
TRANSFER TO				
TRANSFER TO				

RESULTS (64)	TYPE OF DEATH (65)	CONSULTATIONS (66)		TOTAL DAYS
	☐ < 48 HRS. ☐ > 48 HRS.			

INSTITUTIONAL INFECTIONS (67)	PATIENT STATUS WHEN DIAGNOSIS IS MADE (68)	DISCHARGED TO (69)	RESP. STATUS AT DISCHARGE (70)

CIRCULATION:
A - INPATIENT
ALL SHEETS
B - REGULAR OUTPATIENT
COPIES 1, 4, 5, 6, 7, 8, 9, 11
C - RESTRICTIVE OUTPATIENT
COPIES 1, 5, 6, 7

CARD 0 2 (79-80)

SIGNATURE M.D.

#1 FACE SHEET *CODE ON REVERSE SIDE

Document #3 Immobilization Study subject candidate questionnaire
(Immobilization Study document)

TEXAS INSTITUTE FOR REHABILITATION AND RESEARCH
in the
Texas Medical Center

IDENTIFICATION DATA

Subject Number: (not to be filled out by applicant) ____ | | | | | | ____

Name: _____
(Last name first)

Date of Birth: _____ | | | | | | _____
Mo. Day Year

Religion: _____

Place of Birth: _____
(City and State)

(Please use proper code numbers in answering questions)

Sex: ___ (1. Male, 2. Female) _____ | | ____

Race: ___ (1. White, 2. Negro, 3. Latin American, 4. Yellow, 5. Other) _____ | | ____

Current Height: ___ (in inches) _____ | | | ____

Usual Weight: ____ (in pounds) _____ | | | ____

Marital Status: ___ (1. Single, 2. Married, 3. Divorced, 4. Widower) ____ | | ____

Current Occupation: __ (1. Student, 2. Employed, 3. Unemployed, 4. Other) _____ | | ____

If employed: 1. Current Occupation: _____
2. Employer: _____

If student: 1. What is major course? _____

2. Where attending? _____

3. Working toward what degree? _____

4. Have you ever been on scholastic probation? _____

5. Have you ever been expelled from school? _____
If yes, give cause: _____

EDUCATION AND WORK EXPERIENCE

List below names of schools (begin with High School) you have attended.

Dates From Mo.	Dates From Year	Dates To Mo.	Dates To Year	Name	Location	Degree Obtained

List below in chronological order any jobs you have held in the past and the length of your employment.

Dates From Mo.	Dates From Year	Dates To Mo.	Dates To Year	Place of Employment	Job Description

PAST MEDICAL HISTORY

DEVELOPMENTAL HISTORY

(Please use proper code in answering questions)

To the following questions answer: 1. Don't know, 2. No, 3. Yes

Were you a full term baby?	
Were you a premature baby	
Did you have any abnormalities at birth?	
Were you breast fed?	
Were you bottle fed?	

As a child did you have any problem with the following:

Feeding or nursing	
Bed Wetting	
Thumb sucking	
Stammer or Stuttering	
Temper Tantrums	
Sleepwalking	
Nightmares	
Eating	
Nervousness	
Convulsions	
Asthma	
Allergies	
Hay Fever	
Chocolate	
Penicillin	
Sulfa	
Other Drugs	
Plants	
Dust	
Insects	

Indicate APPROXIMATE age in months of the following: (if known).

Sitting up		
Walking		
First Distinctive Words		

ILLNESSES

The following is a list of frequent illnesses in childhood or adulthood. Please indicate whether or not you have had any of them. If you do not know, please indicate.

Disease	Don't know	No	Yes	Age	Where hospitalized if known.	Complications if any.
Measles						
German measles						
Chicken Pox						
Whooping Cough						
Mumps						
Diptheria						
Frequent Colds						
Scarlet Fever						
Typhoid Fever						
Asthma						
Rheumatic Fever						
Pneumonia						
Bronchopneumonia						
Abscessed Ears						

List all other illnesses that you have had.

Year	Age	Disease or Complaint	Were you hospitalized? If so, where?	Recovery complete? If not, complications.

Venereal Diseases: Syphilis, Gonorrhea or other (please specify).

Year	Age	Disease	Were you treated?	Were you given full clearance?

Immobilization Study
Subject Candidate Questionnaire

Allergies: Are you at the present time allergic to any one of the following? If you have allergies to agents not indicated below, please list them in the blank spaces provided. Indicate: 1. Don't know, 2. No, 3. Yes

Hay Fever		
Chocolate		
Penicillin		
Sulfa		
Other Drugs		
Plants		
Dust		
Insects		
Other:		

OPERATIONS

List all known operations since birth, even minor ones such as circumcision. Be as precise as possible in giving dates.

Date						
Mo.	Day	Year	Type of Operation	Name of Physician	Where hospitalized	Remarks

INJURIES OR ACCIDENTS

List all injuries or accidents requiring the services of a physician. Be as precise as possible in giving dates.

Date						
Mo.	Day	Year	Type	Name of Physician	Hospital	Remarks

IMMUNIZATION RECORD

Use Code: 1. Don't know, 2. No, 3. Yes

Small Pox	
Last vaccination against Small Pox was in year:	
Diphtheria	
Last vaccination against Diphtheria was in year:	
Whooping Cough	
Last vaccination against Whooping Cough was in year:	
Tetanus	
Last vaccination against Tetanus was in year:	
Typhoid Fever	
Last vaccination against Typhoid Fever was in year:	
Yellow Fever	
Last vaccination against Yellow Fever was in year:	
Armed Forces Routine Vaccinations	
Last time I received Armed Forces Routine Vaccinations was in year:	
Poliomyelitis Salk Vaccine	
Number of injections to date	
Last injection was received in year:	
Poliomyelitis Sabin Type I	
Last time I received this vaccine was in year:	
Poliomyelitis Sabin Type II	
Last time I received this vaccine was in year:	
Poliomyelitis Sabin Type III	
Last time I received this vaccine was in year:	
Any other vaccines you have received: Give name and year.	

Have you received the following immunizing agents? Use Code: 1. Don't know, 2. No, 3. Yes. Indicate when you last received the serum by year.

Serum against Tetanus	
What year	
Serum against Diphtheria	
What year	
Gamma Globulin	
What year	
Any other: Give type and year.	

FAMILY HISTORY

LIVING RELATIVES

Check if you are adopted son		
Relation	Age at present	
Paternal Grandfather		
Paternal Grandmother		
Maternal Grandfather		
Maternal Grandmother		
Father		
Mother		
Brother		
Brother		
Brother		
Brother		
Brother		
Brother		
Brother		
Sister		
Sister		
Sister		
Sister		
Sister		
Sister		
Sister		
Spouse:		
List your living children: (indicate if any of the children are adopted)		
Son		
Son		
Son		
Son		
Daughter		
Daughter		
Daughter		
Daughter		

FAMILY HISTORY

DECEASED RELATIVES

Relation	Cause of Death	Age at Death	
Paternal Grandfather			
Paternal Grandmother			
Maternal Grandfather			
Maternal Grandmother			
Father			
Mother			
Brother			
Brother			
Brother			
Brother			
Brother			
Brother			
Brother			
Sister			
Sister			
Sister			
Sister			
Sister			
Sister			
Sister			
Spouse:			
Children:			
Son			
Son			
Son			
Son			
Daughter			
Daughter			
Daughter			
Daughter			

DISEASES IN FAMILY

Disease	Don't know	No	Yes	Relatives affected
Diabetes				
Cancer				
Tuberculosis				
Asthma				
Epilepsy				
Stroke				
Mental Disorder				
Nervous System disease				
High Blood Pressure				
Heart Disease				
Migraine				
Leukemia				
Arthritis				
Hay Fever				
Paralysis (any form)				
Other:				

MILITARY SERVICE

If you have served in any branch of the Armed Forces, please answer the following questions.

Branch of service

Total number of months in service Classification

If you received dishonorable discharge, give cause:

If you have retained reserve status, give last date of duty tour and location:

List any honors or decorations you received while in service:

SOCIAL HISTORY

SMOKING

Use code: 1. Don't know, 2. No, 3. Yes, in answering the following questions.

Have you ever smoked?
Do you now smoke?
If yes to above question:
How many cigarettes per day do you smoke?
How many cigars per day do you smoke?
How many pipes per day do you smoke?
Do you use tobacco in any other form?
If yes, explain:

DRINKING

Have you ever drunk alcoholic beverages?
Do you now drink alcoholic beverages?
If you drink socially put a check mark in the box.
If you drink regularly, indicate the average number of drinks per day you take.
If you drink beer regularly, indicate the average number of beers you drink per day.
Please indicate your average daily consumption of the following:
Coffee (indicate the number of cups)
Hot tea (indicate the number of cups)
Cold tea (indicate the number of glasses)
Milk (indicate the number of glasses)
Coke (indicate the number of bottles)

DIET

Describe your average breakfast:

Describe your average lunch:

Describe your average dinner:

Immobilization Study
Subject Candidate Questionnaire

SOCIAL HISTORY

DIET (continued) Use code: 1. Don't know, 2. No, 3. Yes

Have you ever dieted to lose weight ?
Have you ever taken medication to help you lose weight ?
If yes, give name of medication and dosage:

Are you at the present time taking medication for weight loss?

EXERCISE

Give an estimate of the amount of exercise that you do in one week. Please use this rating. 1. Minimal amount, 2. Moderate amount, 3. A lot.

SPORTS

Use code: 1. Don't know, 2. No, 3. Yes

Have you ever been engaged in active sports?
Are you now engaged in active sports?
Please indicate the sports in which you have participated in the past and those in which you now participate.

DRIVING

Use code: 1. Don't know, 2. No, 3. Yes

Have you been or are you now a regular operator of any of the following vehicles?
Car
Plane
Motorcycle
Bus or Public vehicle
Power boat
Sail boat
Other:

Immobilization Study
Subject Candidate Questionnaire

RESIDENCES

Please list below the names of the places where you have resided.
Give name of town only:

Dates		
From	To	Name of town

Have you ever lived or visited in another country?
Use code: 1. Don't know, 2. No, 3. Yes: ☐
If yes, give the name of the country and the length of your stay.

CONTAGIOUS CONTACTS

Please indicate with check in box if you have had any recent contagious contact with any of the following illnesses.

measles	☐
chicken pox	☐
mumps	☐
meningitis	☐
tuberculosis	☐
typhoid fever	☐
poliomyelitis	☐
flu	☐
venereal disease	☐
hepatitis	☐
other:	☐
	☐
	☐

CURRENT MEDICATIONS

If you are currently taking any medications (including aspirin) please indicate the following:

Name of medicine	Amount	Frequencey	Only occasionally

SYSTEMS REVIEW

Please put a check mark (✓) in box if you have or have had any of the following.

HEAD

- Frequent headaches ☐
- Frequent pain in face ☐
- Pounding headaches or flushing of the face ☐
- Migraine ☐
- Intermittent swelling of the face not related to injury or infection ☐

EYES

- Need to use glasses ☐
- Contact lenses ☐
- Farsightedness ☐
- Nearsightedness ☐
- Astigmatism ☐
- Crossing of the eyes ☐
- Blind spots ☐
- Partial blindness of your visual field ☐
- Difficulty in seeing at night ☐
- Color Blindness ☐
- Yellowish discoloration of the eyes ☐
- Swelling of the eyelids in the mornings ☐
- Pain in the eye ☐
- Burning or itching of the eyes ☐
- Pressure feeling in the eyes ☐
- Double Vision ☐
- Lump in the eyelid ☐
- Injury to the eye ball ☐
- Operation in the eye ☐
- Intolerance to bright light ☐

EARS

- Severe earache ☐
- Draining in ears ☐
- Ruptured ear drum ☐
- Temporary or permanent hearing loss ☐
- Ringing or buzzing in the ears ☐
- Dizziness ☐
- Air sickness ☐
- Motion sickness ☐
- Mastoiditis ☐
- Otitis media ☐

SYSTEMS REVIEW

EARS (continued)

Trouble with your ears after swimming	
Fungus infection of the ears	
Extreme sensitivity to noise	
Injury to the ear	
Surgery to the ears	

NOSE

Frequent head colds	
Frequent sneezing	
Excessive nasal discharge	
Frequent nose bleeding	
Post Nasal drip	
Trouble breathing through the nose	
Deviation of the septum	
Fracture of the nose	
Surgery of the nose	
Acute sinus infection	
Chronic sinus infection	
Difficulty in smelling various odors	
Stuffy nose	
Allergic reaction to:	
Plants	
Dust	
Insects	
Other	
If yes to above, specify:	

MOUTH

Frequent sores inside of the mouth	
Fever blisters around the mouth or throat	
Frequent bleeding or tender gums	
Complete or partial dental plates	
Pyorrhea or infection of the gums	
Large number of cavities in your teeth	
Excessive bleeding following extraction of tooth	
Frequent toothache	
Intolerance to cold in contact with the teeth	
Intolerance to heat in contact with the teeth	
Dental work in the last six months	
Foul breath or halitosis	
Excessive dryness of the mouth	
Abnormality in sense of taste	

SYSTEMS REVIEW

THROAT

- Difficulty in pronouncing words
- Frequent soreness in throat
- Hoarseness
- Recent and permanent change in your voice
- Stuttering
- Difficulty in swallowing

SKIN

- Frequent pimples or boils
- Acne or pimples on face
- Easy bruising
- Excessive sweating
- Ulcers on any part of your skin
- Discoloration of the skin
- Any moles
- Skin rashes
- Dryness of the skin
- Greasy coating of the skin
- Giant hives (urticaria)
- Excessive loss of hair
- Changing in the texture of the hair
- Excessive softness of the hair (seborrhea)

NECK

- Deformities of the neck
- Enlargement of the glands of the neck
- Tumors or masses in the neck
- Pain or stiffness in the neck
- Whiplash accident
- Wryneck
- Visible pulsating veins

SPINE

- Slipped disc
- Low back pain
- Back injury
- Deformity of the spine
- Fracture of the spine

Immobilization Study
Subject Candidate Questionnaire

SYSTEMS REVIEW

RESPIRATORY

Chronic or recurrent cough	
Coughing up of blood or pus	
Pain in chest	
Shortness of breath while lying down	
Shortness of breath while sitting up	
Asthmatic attacks	
Chest wheezes	
Collapsed lung	
Shingles of the chest wall (small vesicles or herpes zoster)	
Pain in the chest on deep breathing	
Pleural inflammation	

CARDIOVASCULAR

Disturbances in the blood supply to the heart (coronaries)	
Bluish discoloration of the lips, skin, fingers or toes(cyanosis)	
Congenital defect in the heart	
Heart murmur	
Enlargement of the heart	
Rheumatic fever affecting the heart	
Anemia	
High blood pressure	
Low blood pressure	
Dizzy spells related to change in posture	
Feeling of light headedness upon arising in the morning	
Hardening of the arteries	
Loss of consciousness from head injury	
Loss of consciousness while receiving an injection	
Have you ever fainted	
Heat prostration	
Sudden changes in the speed of the heart beat(too fast or too slow)	
Sensation of skipping a beat (extra systoles)	
Chest pain during exercise	
Occasional dizzy spells	
Easy tiring with slight effort	

DIGESTIVE

Stomach distention	
Discomfort in stomach during night	
Burning sensation in stomach that is relieved by milk, alkalines or food	
Frequent indigestion	
Tendency to vomit	

SYSTEMS REVIEW

DIGESTIVE (continued)

- Tendency to belch
- Severe pains in the stomach
- Intermittent pain in the abdomen
- Need to get up in the morning hours to eat or drink to relieve pain in the stomach
- Peptic ulcer
- Gallbladder disease
- Gallstones
- Liver disease
- Jaundice
- Cirrhosis
- Hepatitis
- Diseases of the pancreas
- Swelling in the abdomen
- Bowel distention
- Irregularity of the bowels
- Frequent constipation
- Frequent diarrhea
- Thin stools
- Clay stools
- Staining of the stools
- Black or tarry bowel movements
- Hemorrhoids
- Itching around rectum
- Rectal polyps
- Rectal fistula or abscess
- Unusual amount of hiccoughs
- Pain in rectum
- Pain during bowel movements
- Lack of control of the bowels
- Large, bulky, foamy or foul smelling stools

ENDOCRINE

- Fluctuations in body weight independent of dieting
- Excessive amount of fat in the body (obesity)
- Excessive weight loss
- Craving for food
- Excessive thirst or craving for water
- Excessive amount of urinary output
- Diabetes
- Need to take insulin
- Fullness of the neck(goiter)
- Need to take thyroid medication
- Dry and scaley skin

Immobilization Study
Subject Candidate Questionnaire

SYSTEMS REVIEW

ENDOCRINE (continued)

Coarse hair	
Protusion of the eyeballs and marked jitters	
Retention of water in the skin and swelling of some parts of body	
Excessive sweating	
Unusual amount of hair (hirsutism)	
Precocious appearance of hair on the body or around the genitalia	
Loss of calcium from the bones	
Tendency to have spontaneous fractures of the bones	

URINARY

Difficulty in passing urine	
Need to have a catheter in bladder for any reason	
Infection of the kidneys	
Infection of the bladder	
Pus in the urine	
Blood in the urine	
Sugar in the urine	
Albumin or protein in the urine	
Dark brown urine	
Kidney stones	
Shooting pains in the back radiating down to the testicles	
Need to get up at night to pass urine	
Frequency in urination	
Burning sensation during urination	
Trouble starting or stopping the stream during urination	
Inability to control your bladder	

GENITALIA (to be filled out by men only)

Circumcision	
Swelling or enlargement of either testicle	
Injury to the testicles	
Itching around the genitalia	
Urethral discharge	
Hernia	
Swelling of the scrotum	
Sexual difficulties	
Sterility	
Infection of the prostate gland	
Enlargement of the prostate gland	
Pain in your penis	
Injury to your penis	

SYSTEMS REVIEW

EXTREMITIES

- Numbness or tingling of the feet
- Numbness or tingling of the hands
- Pain in the calves of the legs while walking
- Shooting pains down the leg
- Swelling or enlargement of the veins in the legs (varicose veins)
- Swelling of the feet or ankles
- Swelling of the hands
- Blood clots in the legs
- Stiffness of the joints
- Dislocation of any joint
- Pain in any joint
- Swelling of any joint
- Injury or fractures of any joint or bones

MUSCLES

- A feeling of weakness in some of your muscles
- Twitching of the muscles
- Loss of muscle mass (atrophy)
- Increase in the size of the muscles (hypertrophy)
- Weakness after exercise
- Low grip strength
- Difficulty in loosing your grip after grasping an object with the hands
- Muscle tenderness
- Inflammation of muscles

CENTRAL NERVOUS SYSTEM

- Coma or unconsciousness
- Convulsions
- Difficulty in falling asleep (insommnia)
- Tendency to fall asleep
- Tendency to be excited
- Weakness or paralysis in any muscle group
- Brisk or jerky reflexes
- Decreased reflexes
- Sustained tremors
- Decreased sensation to touch in any part of the body
- Decreased sensation to heat or cold
- Need to have a spinal tap
- Injury that has rendered you unconscious
- Encephalitis
- Meningitis
- Electroshock treatments

SYSTEMS REVIEW

CENTRAL NERVOUS SYSTEM (continued)

Surgery to the brain or spinal cord	
Injury to surgery to nerve	
Transient or permanent loss of memory	
Difficulty in identifying objects	
Staggering gait	

GENERAL

Have you ever had any blood transfusions reactions	
Have you ever been exposed to any of the following:	
Toxic substances (be specific)	
X-ray radiation	
Poisons (be specific)	
Chemicals (be specific)	
Other toxics:	

REMARKS: (not to be filled in by subject candidate)

Social Service Section I - Immobilization Study

NAME_____ No._____ Date_____

I Motivation for Participation

A. Primary Reason

B. Secondary Reason

C. How did you first learn of Study?

D. How long did it take for you to reach decision to participate?

E. Did you discuss the advisability of your participating with other persons prior to reaching decision? No; yes

F. If yes, who was consulted?

G. What was your family's reaction to your participation in Study?

H. Do you have any regrets about agreeing to participate? No; yes

I. If yes, what are bases for regrets?

II Acquaintance With Other Subjects

A. Did you know any of the other five men before the Study began? No; yes

B. If yes, names of subjects known and how associated.

III History of Origin

A. Birth Date_____ B. Birth Place_____
C. Nunber of Siblings_____ D. Birth Order_____

E. Reared by natural parents; adoptive parents; foster parents; other = (specify)
F. Where reared:

G. Birth place of father:

H. Birth place of mother:

I. Was any language other than or instead of English spoken in parental home? No; yes
J. If yes, specify language_____
K. Educational level attained by subject _____
L. Educational level attained by father _____
M. Educational level attained by mother _____
N. Educational level attained by siblings_____

O. Age at which subject left parental home_____

IV Marital History; Progeny

A. Current marital status: single; married; separated; divorced; widowed
B. Number of marriages_____
C. Date of present marriage_____
D. Date of first marriage (if married more than once)_____
E. How was previous marriage terminated_____; date_____
F. Number of previous marriages of spouse_____
G. Number of natural children_____
H. Number of adopted or foster children_____
I. Do all children live with subject? Yes; No
J. If NO, where and with whom do children live?

V Residence and Household Membership

A. How long have you resided in town of your legal residence?_____
B. How long have you lived at present street address?_____
C. How many times have you moved in past 10 years?_____
D. Give relationship and ages of persons residing in same household with you:

E. Type of dwelling occupied: Single unit house; duplex; apartment; rooming house; dormitory; fraternity house; trailer house; other (specify)
F. Living quarters are owned, rented, provided rent free

VI Health

A. Do you consider yourself physically fit? Yes; No
B. If no, what are your health problems:

C. Do you have a regular family physician? Yes; No
D. How often do you have a general physical examination?
E. Are there health problems in other members of your immediate family? No; Yes
F. If yes, explain

G. Do you consider yourself light sleeper; heavy sleeper?
H. Are there any particular foods that you feel that you are unable to eat? No; Yes
I. If yes, explain

J. Smoking habits

K. Drinking habits

VII Occupational Status

A. Present occupation_____

B. Length of time employed by present employer_____

C. If present occupation is not usual occupation, state the latter _____

D. If currently unemployed (how long has unemployment existed_____

E. If currently unemployed what was last occupation_____

F. At what age did you begin working? _____

G. What are chances of promotion in present position?

H. How many times have you changed jobs since entering employment market? _____

I. How many of these job terminations were initiated by your employer _____

J. If present classification is that of student what vocation are you preparing for_____

K. Explain types of part-time jobs held while on student status.

VII. Ecomonic Status

A. Source of present income
B. Amount of income - $_____
C. Usual income, if current income not representative - $_____
D. If married, is your wife employed? No; yes; N.A.
E. If yes, occupation and salary of wife - _____; $_____
F. Do you contribute toward the support of anyone outside your household? No; Yes
G. If yes, relationship and amount of contribution - _____ $_____
H. Do you have dependents other than wife and children living in home with you? No; yes
I. If yes, relationship of dependents

J. Do your monthly expenses exceed your income? Never; occasionally; frequently; regularly
K. At present do you consider your debts to be minimal; moderate; excessive
L. Do you have a savings account? Yes; no
M. Do you have life insurance? Yes; no: Hospitalization Insurance - Yes; no
N. How often do you usually buy a new car?

O. Have your bills ever been turned over to an agency for collection? Yes; no

IX Military Service

A. Have you served in any branch of Armed Forces? Yes; no
   1) If answer is no; what is your present classification with Selective Service System _____
   2) If answer is yes; give branch of Service and dates

   _____; _____to_____

B. Was your period of service well-timed (that is in terms of personal plans educational and vocational goals)? Yes; no
C. Explain basis for above answer

X Relationships

A. While growing up how did you get along with
   1. Father
   2. Mother
   3. Siblings

B. Describe status of current relationship with
   1. Father
   2. Mother
   3. Siblings
   4. Father-in-law
   5. Mother-in-law
   6. Wife's siblings

C. Have you had misunderstandings or disagreements with -

	never - occasionally - frequently	
Neighbor		
Landlord		
Co-workers		
Employers		
Friends		
Classmates		
Creditors		
Other (specify		

XI Family Life

A. Who has major responsibility for discipline of children?
B. Does management of children seldom or frequently cause disagreements in the home?
C. Who in your family is primarily responsible for handling finances and planning expenditures?

D. Do disagreements arise regarding management of finances? NEVER; occasionally; frequently

E. What is your religious affiliation?
F. What is your wife's religious affiliation?
G. Do differences in religious philosophy cause disagreements between you? Never; occasionally; regularly
H. How frequently do you attend church? Never; occasionally; regularly
I. What kinds of activities do you and your family engage in together as a group?

J. Do you consider your and your wife's sexual adjustment as ideal; acceptable; unsatisfactory?
K. What is the chief cause of friction in your marriage?

L. Have either you, your wife or both ever sought guidance or consultation regarding marital problems from the following:

Marriage counselor	Yes	No
Social worker	Yes	No
Minister	Yes	No
Psychologist	Yes	No
Family physician	Yes	No
Psychiatrist	Yes	No
Friend	Yes	No
Other (specify)		

M. In your opinion is your marriage very happy; moderately happy; unsatisfactory?

XII Leisure Time Activities

A. Sedentary

	Regularly	Occasionally	Never
1. Read newspaper			
2. Other reading interests (specify)			
3. Watching TV			
4. Games, cards, Bridge, Chess Dominoes			
5. Movies; plays			
6. Play musical instrument			
7. Listen to music - records, radio, concerts			
8. Crafts			
9. Other (specify)			

B. Active

	Regularly	Occasionally	Never
1. Horseback riding			
2. Swimming			
3. Fishing			
4. Boating			
5. Water skiing			
6. Camping			
7. Hunting			
8. Skating			
9. Tennis			
10. Football			
11. Basketball			
12. Baseball			
13. Auto racing			
14. Pool			
14. Golf			
16. Bowling			
17. Archery			
18 Gardening			

XIII Unusual Behavior

A. How many times have you received tickets for traffic violations?
B. What was the nature of these violations?

C. Has your drivers license ever been suspended or cancelled? No; yes
D. If yes, why was it suspended or cancelled?

E. Have you ever been arrested for any offense other than traffic violations?
No; yes
F. If yes, describe circumstances:

XIII Unusual Behavior (continued)

G. In elementary school, high school or college, were you ever disciplined (for reasons other than scholastic) by suspension, probation or expulsion? No; yes

H. If yes, give reasons and grade level at time of incidence

I. In your opinion what is the wisest act or decision of your life?

J. In your opinion what is the most foolish act or decision of your life?

XIV Community Responsibility of Participation

A. Membership in Organizations

	None.	Active.	Inactive
1. Fraternal			
a)			
b)			
2. Religious			
a)			
b)			
3. Social			
a)			
b)			
c)			
3. Political			
a)			
b)			
4. Professional			
a)			
b)			
5. Labor Union			
a)			
b)			
6. College Fraternity			
7. Chamber of Commerce			
8. Special Interest Clubs			
a)			
b)			
c)			

B. Did you pay your poll tax this year? Yes; no

C. Politically do you consider yourself conservative; liberal; no opinion

D. Do you assume some responsibility with fund raising drives put on by churches, charitable organizations or special health programs? Never; occasionally; often

XV Subject's Understanding of Self

A. What do you consider as your greatest strengths or assets?

B. What are your major deficits, liabilities or inadequacies?

C. What, in general, are your goals or desires in life in respect to your own personal ambitions, your hopes for your family and vocational aspirations (global view)?

D. Are the possibilities good that you may achieve these goals? Yes; uncertain; no

E. If negative or doubtful, what seem to be the factors that may interfere with realization of goals?

F. What is your greatest concern in respect to your total life situation?

G. What is your chief concern in relation to your participation in this study?

XVI Other General Comments Made by Subject

XVII Social Worker's Assessment of Subject's Attitude Toward this Interview

XVIII Initial Overall Evaluation of Subject

Social Service - Section II - Immobilization Study

NAME _____ No. _____ Date _____

I What has been your contact with your family since reporting to this project?

II If your family is aware of the routine of the study, what is their present reaction to your participation?

III Has anything happened within your family or "on the outside" since project began that causes you to be worried or concerned? No; yes

IV If yes, describe situation.

V Is your concern - slight moderate excessive

VI Interviewer's evaluation of subject's above concern - slight moderate excessive

VII How do you feel about your participation in project at this point?

VIII Have you been tempted at any time to leave? No; yes

IX If so, why?

X What caused you to reconsider?

XI What has been the most difficult part for you?

XII What part do you like best?

XIII What part do you like least?

XIV Has boredom been a problem? never occasionally frequently

XV Which one of the men seems to be the leader of the group?

XVI How do you usually spend your time during the periods that you are free to leave the building?

Section II (continued)

XVII With which of the men do you feel most congenial or friendly?

XVIII With which of the men do you feel least congenial?

XIX How do you feel that the group gets along together as a whole?

XX In general, how have you been treated by the personnel of the project?

XXI In your opinion is the financial compensation adequate? yes no

XXII Would you be willing to repeat this experience? yes no

XXIII Why?

XXIV Do you have any suggestions that might make the subject's role easier in future projects?

XXV Have you been sleeping well? yes no

XXVI Have you had any difficulty with the meals?

XXVII Do you think you will be interested in continuing an acquaintance with any of the five men when project is over? No; yes

XXVIII If so, who?

XXIX Classify your feelings in general during the time that you have been in the study:

A. Completely relaxed and at ease at all times.
B. Relaxed and at ease the majority of time.
C. Mixed feelings (50 - 50) part time relaxed; part time tense and apprehensive.
D. Tense and apprehensive majority of time.
E. Tense and apprehensive at all times.

XXX What do you plan to do as soon as you go out on pass for several days?

XXXI Other Comments Made by Subject

Interviewer's Evaluation of Subject at this Stage

Social Service Section III - Immobilization Study

NAME_____ No._____ Date_____

I How do you feel about the project now that it is over?

II In your opinion is the financial compensation adequate? Yes; no

III Would you recommend this type of study to a friend of yours? Yes; no

IV Why?

V How did you spend your time when you were on pass for several days?

VI Has anything happened within your family or "on the outside" during latter part of study to cause you concern or worry? No; yes

VII If yes, describe the situation

VIII Do you feel that your worry or concern in respect to above has been - slight; moderate; excessive?

IX Interviewer's evaluation of subjects concern - slight; moderate; excessive

X Has there been any change in your feelings re. [ ] with whom initially you felt most congenial? No; yes

XI If yes, explain

XII Has your attitude changed regarding the person in the group [ ] for whom you care the least? No; yes

XIII If yes, explain.

XIV Which of the subjects seems to have been the leader of the group the last half of the study?

XV Do you anticipate seeing any member of the group at any future time?

XVI What part of the study held the most interest or attraction for you?

XVII After having become familiar with the routine, was it - easier; harder no different, to return for last part?

XVIII Has the group spirit or morale changed during the course of the project? No; yes

XIX If yes, explain

Immobilization Study (continued)

XX Do you have any recommendations to make regarding future studies? No; yes

XXI If yes, these are:

XXII Do you feel that you were able to perform adequately in all tests and other routines required of you? Yes; no.

XXIII If no, in which situations do you think you could have produced better results or have cooperated more fully?

XXIV To what do you attribute your failure to produce at your maximum potential?

XXV Classify your feelings in general during your participation in the study:

A. Completely relaxed and at ease at all times.
B. Relaxed and at ease the majority of the time.
C. Mixed feelings (50 - 50) part time relaxed; part time tense and apprehensive.
D. Tense and apprehensive throughout entire study.

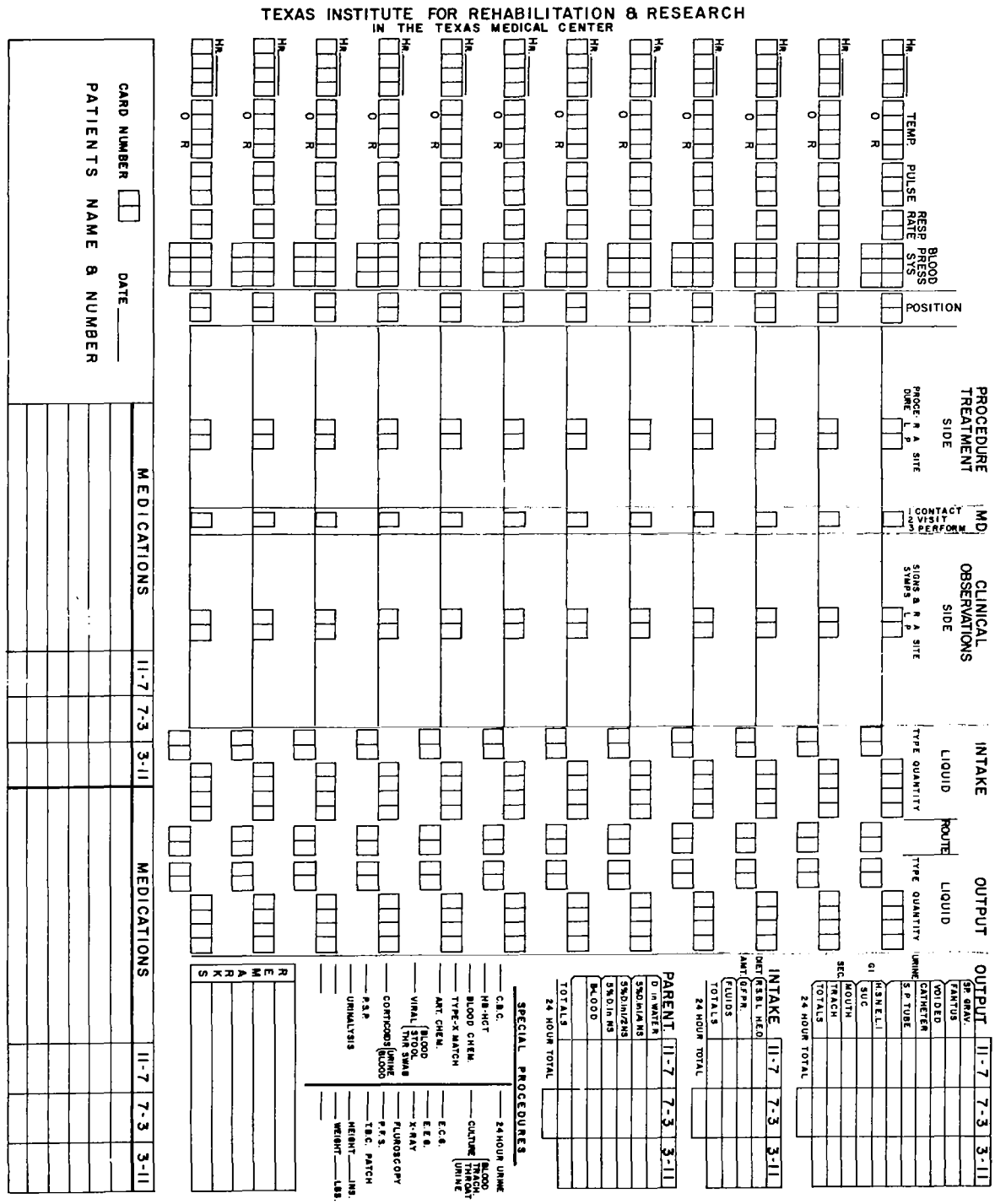
XXVI Would you be willing to repeat this experience? Yes; no

XXVII Reason for above answer

XXVIII Other Comments Made by Subject

Final Overall Evaluation by Interviewer

Document #5 Bedside information document (TIRR document)



Document #6 Bedside information document (Immobilization Study document)

Immobilization Study

RECORD SHEET NO. _____ SUBJECT NAME _____

DATE _____ SUBJECT NO. _____

FLUID INTAKE			URINE OUTPUT				
Time of intake	(ml) Volume	Comments	Time of each voiding	Vol. (ml) ea. void	Specific Gravity	Sugar	Comments
12 hour total			12 hour total				

Enter same information below as recorded on sample label (from pooled 24 hour sample)

Subject No.	Time	Date	ml sent Utah	ml sent Wash	ml sent Mack	ml sent MSC	ml for TIRR

Feces Information

Subject No.	Weight (gms)	Comments

IS 5/1/63

Texas Institute for Rehabilitation and Research

BEDSIDE OBSERVATIONS
TO BE MADE BY ORDERLIES

IMMOBILIZATION STUDY

TIME Hour	Min.	am or pm	TEMP F^0	Signs and Symptoms	Awake	Asleep	Weight	

Date

Mo.	Day	Year

Subjects name and number

Document #7 Hematology source document (TIRR document)

TEXAS INSTITUTE FOR REHABILITATION AND RESEARCH
Houston 25, Texas

Requested by _____ M.D. Clinic ____ Station _____

Specimen obtained: Date: _____ Time _____ AM PM
6-11 17-21

Clinical Diagnoses: _____

For CBC check here ___ CBC (includes Hb, Hct, WBC differential) 1304 05
Otherwise check tests needed.

RED CELL SERIES (x in 60)

27-30 ___ Hemoglobin (Hb, Hgb) [ ][ ][ ] g/100 ml blood..... 1301 02
31-32 ___ Hematocrit (Hct)... [ ][ ] %..... 1302 02
33-36 ___ Erythrocyte Count (RBC) [ ][ ][ ] million per cu. mm..... 1303 03
Erythrocyte characteristics (all) to 4+):
37 Hypochromia..... [ ]
38 Anisocytosis..... [ ]
39 Poikilocytosis..... [ ]
40 Polychromasia..... [ ]
41 Sickle cells..... [ ]
42 Target cells..... [ ]
43 Reticulocytes..... [ ]
44 Basophilic stippling [ ]
45 Other..... [ ] _____
(see below for Sickle cell preparation and Reticulocyte count)
___ Erythrocyte indices: 1305 08
46-47 ___ Mean corpuscular hemoglobin (MCH) (27-31 picograms) [ ][ ]
48-49 Mean corpuscular volume (MCV) (89-92 cubic microns) [ ][ ]
50-51 Mean corpuscular Hb concentration (MCHC) (32-36%) [ ][ ]
52-55 ___ Reticulocyte count (0.5 to 1.5%) [ ][ ][ ] % of RBC's 1306 03

WHITE CELL SERIES

56-60 ___ White cell count (WBC) [ ][ ][ ] thousand per cu. mm. 1307 02
___ Differential count..... 1308 02
Neutrophiles
61-62 Segmented [ ][ ]
63-64 Band forms [ ][ ]
65-66 Lymphocytes ... [ ][ ]
67-68 Monocytes ..... [ ][ ]
69-70 Eosinophiles... [ ][ ]
71-72 Basophiles..... [ ][ ]
73-74 Immature forms [ ][ ]
75-76 ___ Sedimentation rate, Wintrobe, corrected [ ][ ] mm/60 min. 1310 05
77 ___ Platelets, visual estimate (Wright's stain) (see below for Platelet count)
D ___ Decreased A ___ Adequate I ___ Increased

(x in 61)

27-30 ___ Bleeding time ..... [ ][ ][ ] min. 1311 02
31-34 ___ Coagulation time, Lee-White [ ][ ][ ] min. 1312 03
35-39 ___ Clot retraction..... [ ][ ][ ] min. [ ][ ] %..... 1314 03
40-42 ___ Eosinophile count..... [ ][ ][ ] per. cu. mm. 1320 03
43-44 ___ Eosinophile smear..... [ ][ ][ ] % 1321 03
45-52 ___ Erythrocyte fragility [ ][ ][ ] % NaCl initial, [ ][ ][ ] % NaCl complete 1322 05
53 ___ L.E. cell preparation 0 ___ negative, 1 ___ positive 1313 07
54-56 ___ Platelet count..... [ ][ ][ ] thousands per cu. mm. 1309 03
57-58 ___ Sickle cell preparation [ ][ ] % of RBC's 1315 05

Date analyzed _____ Analyzed by _____
Code [1][3] (79-80)

HEMATOLOGY SOURCE DOCUMENT
TIRR - LAB - #1
Rev. 4/62

Patient's name and number (1-5)

Document #8 Routine urinalysis source document (TIRR document)

Clinic_____Station_____

TEXAS INSTITUTE FOR REHABILITATION AND RESEARCH
IN THE
TEXAS MEDICAL CENTER
1333 MOURSUND AVENUE
HOUSTON, TEXAS

Requested by:_____M.D.

Specimen obtained: Date_____ (6-16) Time_____ (17-26) AM PM

Specimen: V___Voided C___Catheterized (27)

Please check analyses needed:

___Routine (includes appearance, color, specific gravity, pH, albumin, glucose, microscopic, and acetone bodies if glucose is positive.)

___Appearance
___Color
___Specific Gravity
___pH
___Albumin
___Glucose
___Acetone bodies
___Bilirubin
___Blood
___Porphyrins and porphobilinogen
___Microscopic
___Other (specify)_____

(x in 60)

MACROSCOPIC RESULTS

Appearance (28)
C___Clear T___Turbid
P___Contains precipitate
B___Gross red cells

Color (29)
C___Colorless B___Brown (coffee)
S___Straw R___Red
Y___Yellow G___Green
A___Amber ___Other

Specific Gravity	1 0	30-34
pH		35-37
Albumin	(plus)	38
Glucose	(plus)	39
Acetone bodies	(plus)	40

Bilirubin (41)
0___Negative 1___Positive

Blood (42)
0___Negative 1___Positive

Porphyrine.....Total___ 43
.....Copro___ 44
..... Uro___ 45
0. Decreased
1. Not increased
2. Moderately increased
3. Markedly increased

Porphobilinogen (46)
0___Negative 1___Positive
2___Strongly positive

MICROSCOPIC RESULTS ON REVERSE SIDE

Date analyzed_____ (73-78) Analyzed by_____ Card Code 1 1 (79-80)

Routine Urinalysis Source Document
TIRR-L- #2
2/62

Patient's Name and number 1-5

MICROSCOPIC RESULTS

(x in 61)

Method (28)
C___Centrifuged U___Uncentrifuged D___Diluted

WBC/HPF (average 3 fields)..... 29-30
Over 100..... 31)x)

WBC clumped (32)
0___Negative 1___Positive

RBC/HPF (average 3 fields)..... 33-34
Over 100..... 35(x)

Epithelial cells
Predominant cells (36)
C__Caudate S___Squamous R___Round
Quantity of predominant cell per HPF..... 37-38
Over 100 ..... 39(x)

Renal cells (40)
0___Absent 1___Present 2___Slow fatty degeneration

Casts per HPF
Finely granular..... 41-42
Coarsely granular..... 43-44
Waxy..... 45-46
Hyaline..... 47-48
WBC..... 49-50
RBC..... 51-52
Epithelial..... 53-54
Cylindroids..... 55-56

(x in 62)

Fungi or yeast (28)
0___None 1___Few 2___Moderate 3____Many

Bacteria
Rods (29)
0___None 1___Few 2___Moderate 3____Many
Cocci (30)
0___None 1___Few 2___Moderate 3____Many

Mucus shreds (31)
0___None 1___Few 2___Moderate 3____Many

Crystals
Amorphous urate..... 32
Uric Acid..... 33
Ammonium biurate..... 34
Amorphous sediment..... 35
Sulfa..... 36
Calcium Oxalate..... 37
Calcium carbonate..... 38
Amorphous Phosphate..... 39
Triple phosphate..... 40
Calcium Phosphate..... 41
Other (specify_____

0.None
1.Few
2.Moderate
3. Many

Document #9 Blood chemistry source document (TIRR document)

TEXAS INSTITUTE FOR REHABILITATION AND RESEARCH
Texas Medical Center
Houston 25, Texas

Requested by _____ M.D. Clinic ___ Station _____

Specimen obtained: Date _____ (12-17) Time _____ (18-22) AM PM Non-TIRR ____

Source of blood: V___Venous C___Capillary A___Arterial H___Arterialized capillary or venous (23)

Condition of patient: F___Fasting P___2 hrs.p.c. R___Random (24)

Please check analyses needed

	Proteins:	x in 60		
25-28	Total serum protein	g%	1801	05
29-31	Albumin	g%	1802	05
32-35	Globulin	g%	1803	00
36-39	Gamma globulin	g%	1834	05
	Serum protein electrophoresis		1826	15
40-42	Albumin	g%		
43-45	Alpha$_1$ globulin	g%		
46-48	Alpha$_2$ globulin	g%		
49-51	Beta globulin	g%		
52-55	Gamma globulin	g%		
56-59	Abnormal globulin	g%		
60-63	Hemoglobin type (electrophoresis)		1835	15
	Lipids:	x in 61		
25-28	Total lipids, fstg.	mg%	1820	05
29-32	do. after cream	mg%	1820	05
33-35	meal ☐ hrs. ☐☐ min.			
43-46	Cholesterol	mg%	1806	06
	Hormones:			
52-55	PBI	mcg%	1808	15
	Inorganic:	x in 62		
25-26	Bicarbonate	mEq/l	1812	08
27-29	Chloride	mEq/l	1813	05
30-32	Sodium	mEq/l	1814	06
33-36	Potassium	mEq/l	1815	06
37-40	Magnesium	mEq/l	1816	08
41-44	Calcium	mEq/l	1817	06
45-49	Phosphate (inorg.)	mM/ l mg%	1818	05
50-53	pH		1819	10
54-56	Iron	mcg%	1828	08
57-59	Iron binding capy.	mcg%	1829	10

___ Other (specify)

	Carbohydrate:	x in 63		
25-27	Glucose, fasting	mg%	1805	05
28-31	☐☐☐☐ g glucose O orally	I___ i.v.		
32-34	Glucose, 1hr after	mg%	1805	05
35-37	Glucose, 2hr after	mg%	1805	05
38-40	Glucose, 3hr after	mg%	1805	05
41-46	☐☐hr☐☐min after	mg%	1805	05
47-52	☐☐hr☐☐min after	mg%	1805	05
	Nitrogenous:			
53-55	Urea (BUN)	mg%	1804	05
56-59	Creatinine	mg%	1811	05
60-63	Uric acid	mg%	1810	05
	Enzymes:	x in 64		
25-29	Alkaline phos'tase	units	1845	08
30-33	Acid phosphatase	units	1824	08
34-37	Prostatic p'tase	units	1840	08
38-40	Amylase	units	1807	08
41-44	Lipase	units	1833	08
45-48	Lactic deH'ase	units	1853	10
59-62	G O transaminase	units	1809	08
63-66	G P Transaminase	units	1848	08
67-69	Prothrombin, plasma	%	1846	06
70-72	Prothrombin, serum	%	1849	06
	Liver function:	y in 65		
25-28	Bilirubin, total	mg%	1842	05
29-32	Bilirubin, direct	mg%	1843	05
33-35	BSP retention 5 mg/kg, 45 min	%	1841	05
36	Ceph.-chol. floc.	plus	1844	05
37-38	Thymol turbidity	units	1847	05
39-41	Icterus index	units	1852	05
	Fluid compartments	x in 66		
25-28	Evans blue space	liters	1858	20
29-32	Thiocyanate space	liters	1859	20
33-36	Antipyrine space	liters	1860	20

Date analyzed _____ (73-78) Analyzed by _____ Card code 1 8 (79-80)

Printout: x in 60, 61 on A; 62, 63 B; 64, 65 C, 66, 67 D.

BLOOD CHEMISTRY SOURCE DOCUMENT
TIRR-LAB-#6 - 5/62

Patient's number and name(1-11)

Document #10 Urine chemistry source document (TIRR document)

TEXAS INSTITUTE FOR REHABILITATION AND RESEARCH

Requested by _____ M. D. Clinic ___ Station _____

Specimen obtained: to Date _____ (From Date: 12-17) Time _____ (AM / PM, 18-22) Non - TIRR ___

Specimen: V ___ Voided C ___ Catheterized (23)

R ___ Random N ___ Night (voided on awakening) M ___ Morning (voided after discarding night urine) (24)

___ Timed specimen of ☐☐ hr. ☐☐ min. (ending at time shown above) (25-28)

Volume of specimen: ☐☐☐☐ ml. (29-32)

Please check analyses needed.

		Amount in specimen		x in 60
33-35	Chloride	☐☐☐	mEq	.2202 06
36-38	Sodium	☐☐☐	mEq	.2203 07
39-41	Potassium	☐☐☐	mEq	.2204 07
42-45	Magnesium	☐☐☐.☐	mEq	.2205 10
46-49	Calcium	☐☐☐.☐	mEq. = _____ mg.	.2206 10
50-54	Phosphate	☐☐☐.☐	mM = _____ mg. as P	.2207 06
		Amount in specimen		
55-58	17-Hydroxycorticoids (17-OH-CS)	☐☐.☐	mg.	.2208 15
59-62	17-Ketosteroids (17-KS)	☐☐.☐	mg.	.2221 10
63-67	4-Hydroxy-3-methoxymandelic acid (MHMA, VMA)	☐☐.☐	mg.	.2222 15
68	5-Hydroxyindoleacetic acid (5HIAA)	0 ___ neg. 1 ___ pos. 2 ___ strongly pos.		.2215 05

---

			x in 61
33-36	Protein	☐☐.☐ g in specimen	.2201 05
37-40	Creatine (as Creatinine)	☐.☐☐ g in specimen	.2210 12
41-44	Creatinine	☐.☐☐ g in specimen	.2211 06
45-47	Creatinine clearance*	.☐☐ ml/min/1.73 sq.m.	.2212 11
48-49	PSP**	.☐☐ % excreted in 15 min.	.2213 05
50-53		.☐☐ % excreted in ☐☐ min.	.2213 05
54-57		.☐☐ % excreted in ☐☐ min.	.2213 05

* For this test, time shown for specimen obtained is time of blood drawing.

** For this test, time shown for specimen obtained is time of dye injection.

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			x in 62
33-35	Glucose	☐☐☐☐ g in specimen	.2209 05
36-39	Xylose	☐☐.☐☐ g in specimen	.2223 08
40	Diagnex Blue A ___ below 0.3 mg. (achlorhydria) H ___ 0.3-0.6 mg. (hypochlorhydria) N ___ above 0.6 mg. (no achlorhydria)		.2220 05
41-43	Urobilinogen, qual.	Positive at dilution of 1 to ☐☐☐	.2224 05
44-46	Urobilinogen, quant.	☐.☐ Ehrlich units in specimen = EU/2hr.	.2225 06
47-50	Lactic dehydrogenase (LDH)	☐☐☐☐ units	.2219 10

---

	x in 63
___ Other (specify)	

Date analyzed _____ (73-78) Analyzed by _____ Card code 22 (79-80)

Print out: x in 60 and 61 on A, 62 and 63 on B

Patient's name amd number (1-11)

URINE CHEMISTRY SOURCE DOCUMENT
TIRR #9
4/62

Document #11 *Routine fecal analysis source document (TIRR document)*

Clinic_____ Station_____

TEXAS INSTITUTE FOR REHABILITATION AND RESEARCH
IN THE
TEXAS MEDICAL CENTER
1333 MOURSUND AVENUE
HOUSTON, TEXAS

Requested by: _____ M.D.

Specimen obtained: Date 6-16 Time 17-26 AM PM

Clinical diagnoses: _____

Reason for request: _____
(This line must be filled in!)

Please check analyses needed: (x in 60)

Appearance:
Color (27)
B Brown T Tarry C Clay Other (specify) _____
Consistency (28)
F Formed W Watery H Hard Other (specify) _____
Abnormal contents (29)
B Gross Blood P Pus M Mucus Other (specify) _____

30 Fat (sudan red) [ ] 0 - 4+
31 Starch (Iodine test) [ ] 0 - 4+
32 Occult blood (guaiac test) [ ] 0 - 4+
33 Ova, parasites, and protozoa [ ] 0 = Negative P = Positive

Nematodes
- Necator americanus (hookworm) [ ] 34
- Strongyloides stercoralis [ ] 35
- Ascaris lumbricoides (ascariasis) [ ] 36
- Enterobius vermicularis (pinworm) [ ] 37
- Trichuris trichiura (whipworm) [ ] 38
- Trichinella spiralis (trichinosis) [ ] 39
- Other (specify) _____

Trematodes (flukes)
- (Specify) _____

Cestodes (tapeworms)
- Hymenolepis nana (dwarf tapeworm) [ ] 44
- Other (specify) _____

Protozoa
- Endameba histolytica (amebiasis) [ ] 55
- Endameba coli [ ] 56
- Giardia lamblia (giardiasis) [ ] 57
- Other (specify) _____

Other (specify) _____

Date analyzed _____ Analyzed by _____ Card Code [1|2] 79-80

Patient's Name and Number 1-5

ROUTINE FECAL ANALYSIS SOURCE DOCUMENT
TIRR-L-11/59

Document #12 Food analysis source document (Immobilization Study document)

TEXAS INSTITUTE FOR REHABILITATION AND RESEARCH

Immobilization Study

Requested by _____ M. D.

Specimen obtained: Date _____ Time _____ am pm

_____ Snack (Description: _____)

_____ Breakfast (Description: _____)

_____ Dinner (Description: _____)

_____ Supper (Description: _____)

_____ Pooled Food of [ ][ ] hours. _____ Weight of pooled food for 24 hr. period

---

_____ Calcium _____

_____ Phosphate _____

_____ Nitrogen _____

_____ _____

_____ _____

_____ _____

_____ _____

Additional: (Specify)

Date analyzed _____ Analyzed by _____

Food Analysis Source Document
IS 5/1/63

Patient's number and name _____

Document #13 Sample document of protocol for one day of second study (Immobilization Study document)

Texas Institute for Rehabilitation and Research
Immobilization Study

MASTER PROTOCOL

AUGUST 31, 1963 Saturday Physician on call: Dr. Harrison

Time	Procedures	Responsible
7 am	finish 12 hour urine collections on all subjects	S, O
	temperatures on all subjects	O
8 am	X-ray densitometry studies on all subjects	M
8:30 am	breakfast	D
	ECG on all subjects	T
9 am	exercise program	T
12:30 pm	lunch	D
1:30 pm	exercise program continued	T
5:30 pm	dinner	D
7 pm	finish 12 hour urine collections on all subjects	S, O
	temperatures on all subjects	O
	bedside monitoring on all subjects	T
9 pm	lights out	
11 pm	T. V. off	
	orderly change	

CODE:

P	Physician	R	Radiology
L	Laboratory	S	Subjects
D	Dietitian	M	Dr. Mack
E	Engineers	O	Orderly
T	TIRR		

IS/ August - September

NASA-Langley, 1965 CR-174